Vol. VIII. No. 11

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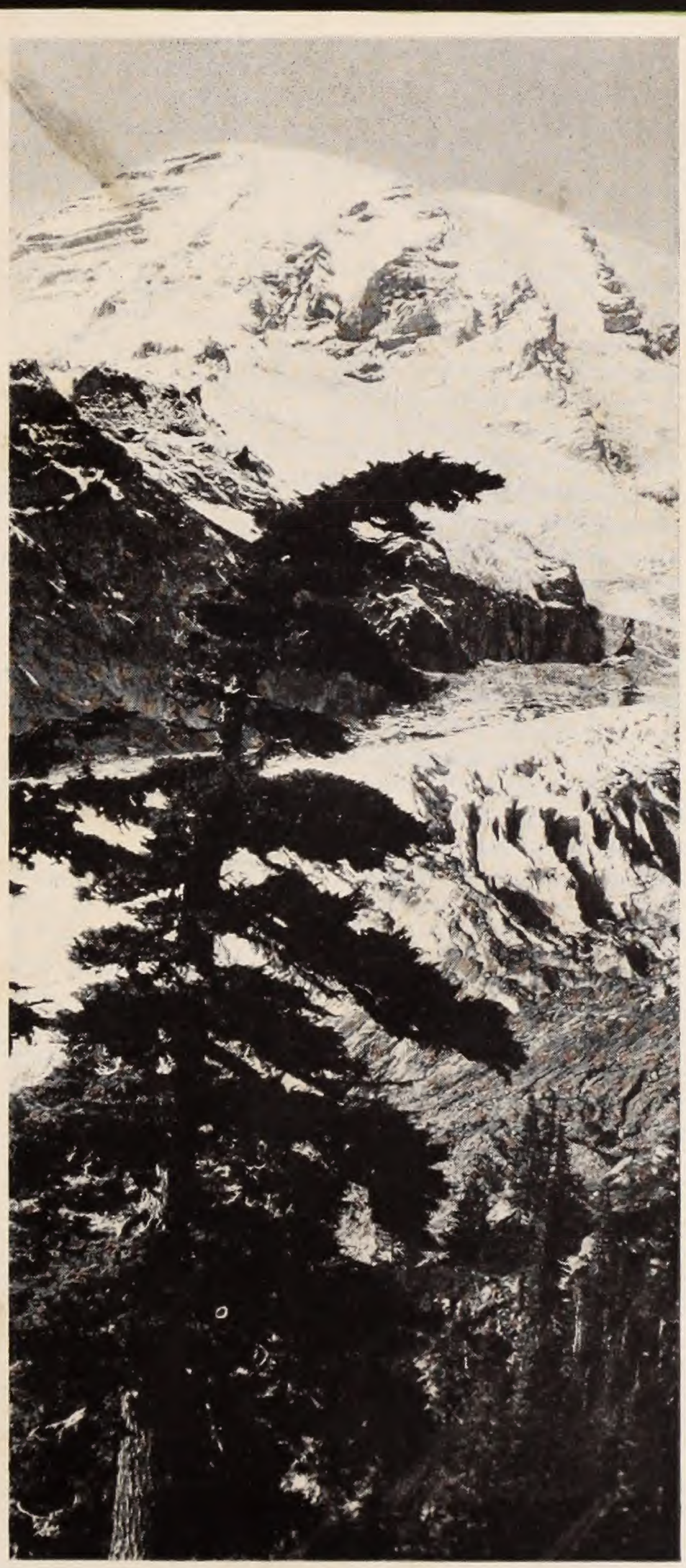
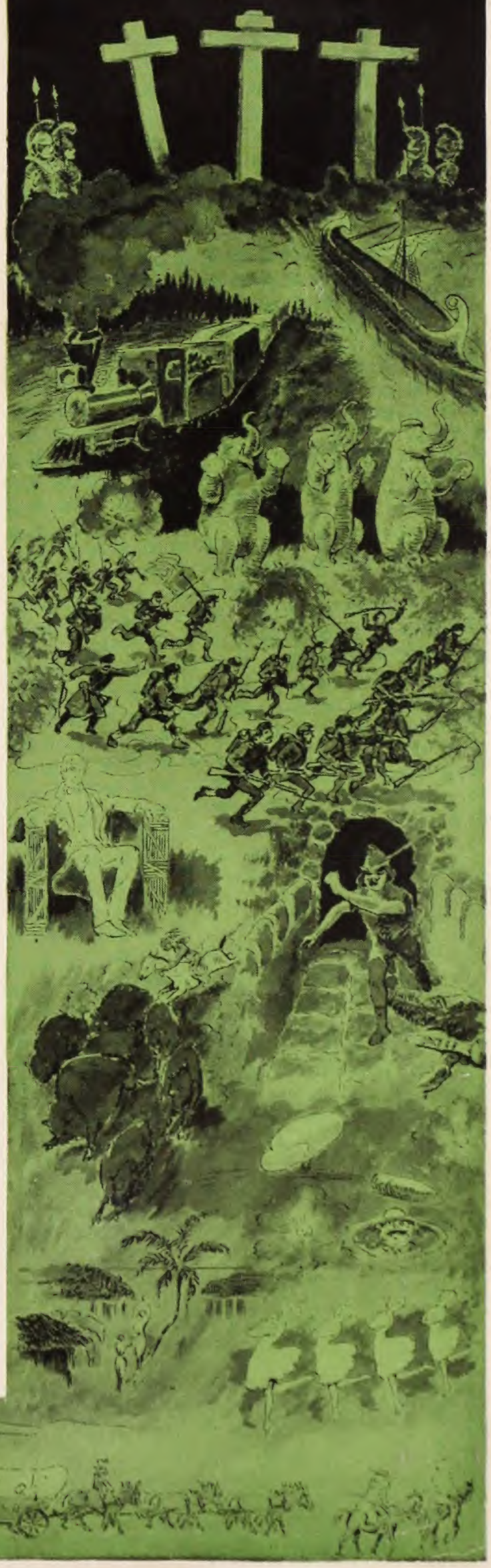
# American Cinematographer



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Vol. VIII February, 1928 No. 11



# American Cinematographer

SILAS EDGAR SNYDER
Editor and General Manager

JOSEPH DUBRAY
Technical Editor

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An educational and instructive publication, espousing progress and art in motion picture photography.

Subscription: United States, $3.00 a year; Canada, $3.50 a year; foreign, $4.00 a year; single copies, 25c.

Published monthly by
THE AMERICAN SOCIETY OF CINEMATOGRAPHERS, INC.

Advertising rates on application.

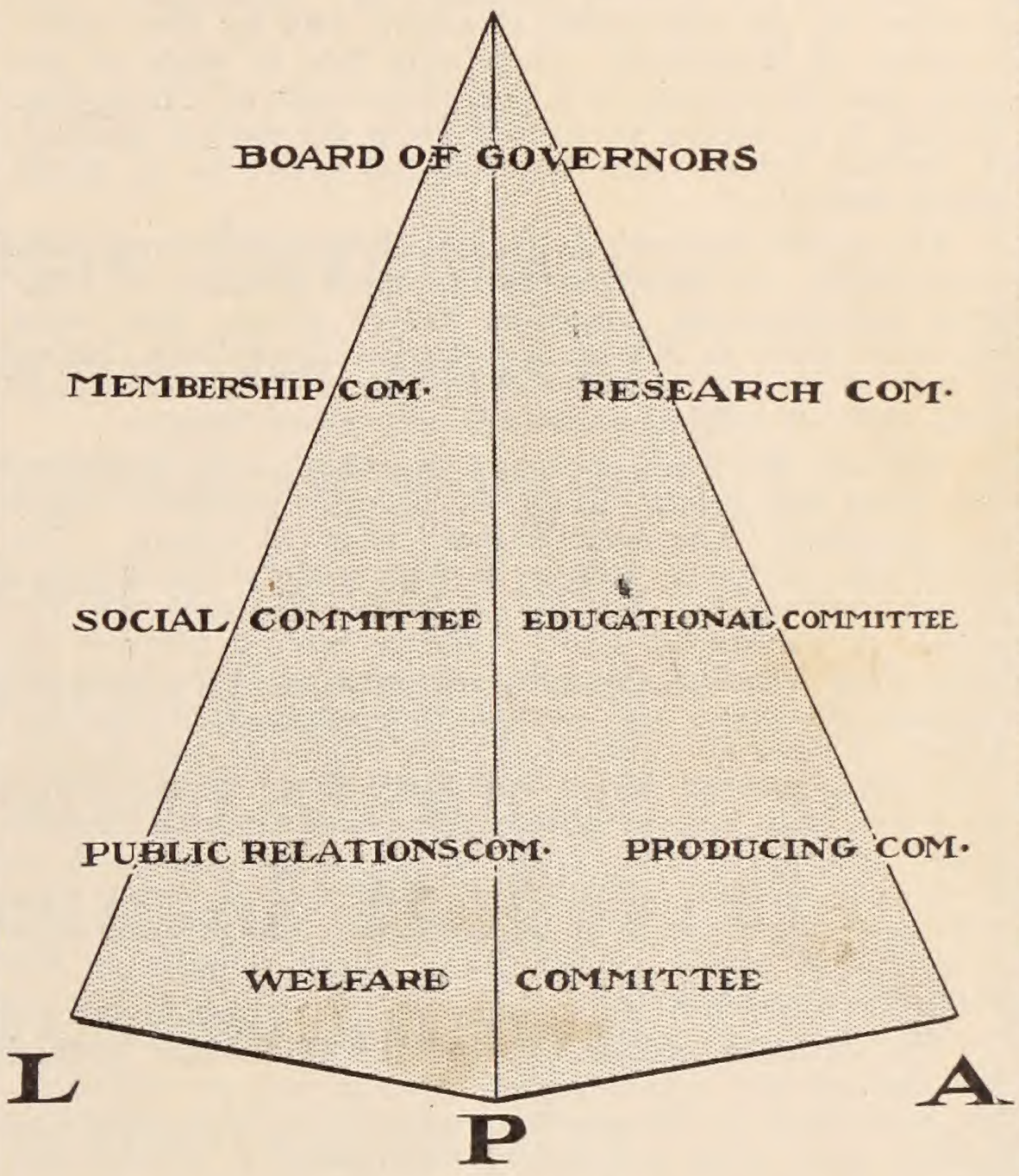
1219-20-21-22 Guaranty Building, Hollywood, Calif.

Telephone GRanite 4274.



# A. S. C.

## The Pyramid of Progress

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# The Talking Pictures

## *Progress Made During the Past Year Toward the Perfection of Motion Pictures that Speak*

WRITTEN FOR THE AMERICAN CINEMATOGRAPHER *by* LEE DEFOREST

Great technical progress has been made during 1927 in perfecting talking motion pictures, including the method using phonograph records, and the Phonofilm method of photographing sound waves on the margin of the cine film. Both systems have been amply demonstrated before the public in motion picture theaters, so that it is now fair to draw certain conclusions relative to the practical and commercial possibilities of the two, the one exploited by Warner Brothers as "Vitaphone;" and the other by the Phonofilm Company and by Fox under the name of Movietone. It is only fair to state at the outset that Movietone is a complete copy of Phonofilm, differing in no essential manner from the earlier method, but having been exploited commercially to a much greater degree.

The public response to vaudeville presentations, such as constitute the prologue to the main picture of Vitaphone presentations, indicates pretty clearly that even with such stars as Martinelli, Mischa Elman and Talley the interest seems to wane after ten or fourteen weeks of this sort of talking picture in any given theater.

Warner Brothers struck a real key note, however, as to what the public enjoys as "talking pictures" when they produced "The Jazz Singer" with Al Jolson. The day of the complete talking motion picture feature has not yet arrived, but I have no doubt that it is not far hence. A successful 100% talking motion picture requires very careful thought, planning of the scenario, selection of artists and general arrangement of the sequence. I have no doubt that some producer will shortly bring out a picture which will meet these requirements and which will forever silence the skepticism of motion picture producers who, until last year had no faith in the talking picture, whatsoever, and most of whom now assert that its value is to be limited to the reproduction of incidental music scored for a silent picture or for occasional noise effects.

The practical advantages of the Phonofilm method over that of the synchronized phonograph in reproduction, have been so clearly demonstrated to those who are familiar now with the actual manipulation of the two methods in studio and theater, as to confirm beyond any question the correctness of my prediction made in 1919 that the success of the talking picture would lie eventually entirely with the method which photographs sound on the film margin. With the Phonofilm method an entirely new art and technique had to be developed from the very beginning, whereas with the synchronized phonograph we had a highly developed industry of the past thirty years to fall back on. The first six years of Phonofilm pioneering resulted in solving the basic problems and demonstrating to any unbiased technician that the method was practical and could, without question, be eventually worked out to a point of perfection equal to, or cancelling that, of the phonograph art. Both the modern method of recording and reproducing from phonograph and that of recording and reproducing from the Phonofilm owe an immeasurable debt to the radio art, or, more particularly, to the art of "audion amplification," without which the highly advanced technique along this line which the demands of Radio Broadcast have produced Vitaphone or the Phonofilm in their present state of perfection would be quite impossibile. But taking full advantage of what the Radio Broadcasting art has produced along these lines there still remain very difficult and intricate problems in Phonofilm, particularly as regards the light recording, sound photographing means; and the successful taking off of sound from the photographic record on the film. And in between lay many problems in photography, exposure, development, printing, and protecting the sound record.

Great progress has been made in the perfecting of the "photion," or gas-filled lamp, which is placed in the camera and which, when connected to the output of the audion amplifier, reproduces perfectly in light variations the electrical values impressed upon its terminals. The photion tube, which I first conceived in 1918 and patented in 1923, has thus far proved its distinct superiority over other methods of telephonic light control such as the vibrating mirror and the "light valve" (the latter is a type of bi-filar Einthoven string galvanometer acting as a shutter to "valve" the light from a fixed source). While the photion is not yet fully perfected its reproduction in light fluctuations of telephonic currents impressed upon it is so nearly perfect, throughout the useful range of audio-frequencies, as to justify our faith in its continued supremacy in the field of sound photography. Its simplicity, compactness, lightness of weight, and ruggedness, as compared with that of the vibrating mirror and light valve, argue powerfully for its continued use in preference to the other types. Particularly do the above advantages hold for portable Phonofilm or "Movietone" equipment, where a light, easily portable camera, to be quickly carried from a truck and set up at a moment's notice for recording swiftly passing topical events, is absolutely essential. And the success of the audible topical weekly is already so abundantly demonstrated as to prove that in the future this feature will become more and more essential in every motion picture program. Much progress has been made also in the design of compact portable picture program. Much progress has been made also in the design of compact portable amplifiers for such recording of outdoor news events.

The difficulties in securing perfect motion of the film past the light source in the camera have been eliminated during the past year, so that now it is possible to secure as perfect film motion with a cheap portable projection machine as is obtained with the finest phonograph turntable.

For use in the projection room of the motion picture theater highly improved amplifiers with sound fade-in and fade-out devices have been largely perfected. The Phonofilm amplifier for the theater has been made very compact and fool-proof, requiring practically no skill on the part of the motion picture operator for its proper manipulation.

Back of the screen has seen possibly the most striking advances of any in this art during the past year. New loud-speakers of entirely novel design, permitting a naturalness of reproduction which is almost uncanny, have been worked out. A new form of screen, transparent to sound and possessing the necessary optical property to throw a brilliant picture, has been found so that the sound no longer seems to emanate from one side or the other or the screen, but directly from the mouth of the speakers wherever they may be in the picture.

Nineteen twenty-eight will see these various improvements which I have described exploited and demonstrated to the public in many hundreds of theaters scattered throughout the country. The chief remaining problems in the talking picture art lie not in the theatre or engineering laboratory, but in the motion picture studio. There scenario writers, producers, artists and cameramen must gradually acquire working knowledge of the new art and how to take full artistic advantages of the countless and immeasurably rich possibilities which this new art has now brought forth for the entertainment and cultural uplift of the motion picture public.

# The A. S. C. expects every member to live up to this:

**"You gentlemen here are known throughout the world without any dispute or question as the greatest exponents of the art of photography—there is no question about it—the cameramen of Hollywood are the greatest known in the art of cinematography—in that field you are supreme."**

*Tribute to the members of The American Society of Cinematographers by Dr. Kenneth Mees, chief of the Research Department of the Eastman Kodak Co.*

# Movie Make-Up

## A Technical and Artistic Analysis of Motion Picture Make-Up With an Historical Sketch

*By* Louis W. Physioc

From the first mention of Dramatic Art, we find that the idea of make-up was, originally, a profession expedient, either as a direct result of the demands of the patrons of the art, or the individual enterprise of the artist, in his effort to influence the imagination of the spectators or to meet the current exigencies of the art. And what is more remarkable, we find all sorts of customs prevailing even after the evolution of the art has made these artifices unnecessary. It is interesting to review the history of this bit of dramatic technique. As remote a period as the first century, B. C., we are furnished descriptions of the make-up idea by the Chinese, Japanese and Hindu dramatists, among whom was a prevailing notion that it was necessary for the actors to disguise their faces with grotesque masks to inspire the effect of terror or humor in the minds of the spectator. The custom must have been successful for it was adopted, also, in warfare; the warrior or actor who could fashion the most terrifying or grotesque mask being the most successful. In 535 A. D., we find this use of the mask mentioned as an invention, ascribed to Thespis. In addition to the modification of the mask, we are told of his having, also, used a pigment for the actor's disguise. This is, probably, the first mention of any form of make-up, as we consider it to-day. This event is also interesting as being the first occasion where a definite reason is given for the custom. This reason was due to the arrangement of the theaters of this period. The great chorus was placed between the audience and the actor, who found himself at such a great distance that it was necessary for him to resort to some means of reaching his audience. This, he achieved by exaggerating his features and expressions by the use of the mask or paint. At a later date, Aeschylus invented the cothurnus, or buskin—a laced boot, to give the actor greater stature. He also modified the mask, introducing a little more refinement into its features. In fact, the poor actor, of that period, was so far removed that he had to depend more on the claque (paid applauders) than to the mask or buskin, to impress his audience. Later, during the development of the Roman Drama, the chorus was placed behind the principal, which brought him in more intimate relationship with his audience and this developed a more critical appreciation. The people began to use their own initiative in expressing themselves through the customary applause, and the claque was abolished. The mask was made still more refined and was often superseded by pigmentary make-up. At this stage of the evolution, different colored wigs were also used to distinguish the different characters. But strange as it may seem, this funny mask, in one form or another, remained in vogue for many centuries and has become a tradition of the stage, and, even to this day, the grinning face of "Comedy" and doleful visage of "Tragedy" may be seen on drop-curtains, and other forms of theatrical decorations, as definite symbols of the drama.

As late as the seventeenth century, comic plays were still being presented, with all of the characters—without any apparent reason—masked. However, there was a particular period when there was a semblance of reason connected with the use of the mask and other forms of disguise. This was at the close of the Elizabethan era when the stage began to find bitter opposition in Puritanism, and was naturally, but unfortunately, led to employ its great medium as a means of exploiting religious and political controversies. After the civil war, Puritanism began to prevail, and in the month of September, 1642, the memorable order went forth: "that while these sad causes and set times of humiliation do continue, public stage plays shall cease and be forborn." Following this proclamation, every one connected with the drama fell into disgrace, and now the mask and other forms of disguise came into their own again, for in spite of this prohibition—as in all such legal stringencies—players still continued to perform, in private dwellings and out-of-the-way places, and like the early days of motion pictures, hid their identity behind masks and make-up.

Then came the abandon of the Restoration, when the drama, following in the wake of a general moral recklessness, set a pace held only by our present day dramatic daring, except that some of the performances of that period were so risque as not to be ventured in public, but were performed in private mansions, and, again, the mask came to the aid of what little modesty was left among those playing such naughty characters.

We next find the most important suggestion, as to innovations in the matter of make-up (as we now consider it) in the year 1720, when dip candles were superseded by moulded candles. Here we find mention of the footlights, "with their unpleasant, upward shadows." This observation, indeed, suggested the necessity of an expedient, and the artifice adopted has prevailed through the days of tallow candle, lamp light, gas and electricity, and brings us very near to our present consideration of the motion picture make-up.

We are shown that a spectroscopic analysis of most forms of artificial light, other than the Cooper Hewitt mercury vapor tube, is composed, mostly, of the yellow, orange and red rays, and these, arranged according to the accepted system of stage illumination—especially the footlights, "with their unpleasant, upward shadows," were very unfavorable to the appearance to the face. These warm lights neutralized all of the ruddy tints of the complexion—the effect being the same as viewing these colors through a yellow or orange glass. In addition to the color of the lights, the general arrangement was such that the modeling of the features was destroyed by this highly scattered form of lighting. To overcome this effect, the actors found it necessary to exaggerate the roseates of the complexion by the use of rouge and lip stick. To improve the modeling, they marked the brows heavily with mascaro, beaded the lashes and shaded eye sockets with a greenish-gray pigment, a color complementary to the warm color of the lights. This treatment was so successful that it has generally influenced the feminine make-up for all occasions.

In like manner, the moving picture artists were confronted with similar problems. In the early days of the industry, they were subjected to the unnatural effects of the Cooper-Hewitts, which created just the opposite effect of the stage lighting, except that they were equally flat lighted. These defects of lighting were, also, combined with crtain photographic difficulties, chief among them being the impossibility of retouching the negatives, as ordinary still photography, and the limited knowledge of the cameraman of those early days. Consequently, the motion picture actor soon learned that the art of make-up aided the flat lighting and smoothed out the imperfections of the skin, in lieu of retouching.

Now the foregoing historical sketch is furnished to show that the adoption of make-up, at all times, was the result of some well defined necessity in the dramatic arts, but that its influence was so great that its application was rigorously maintained even when evolution might have allowed of modification. This was due to the common timidity as regards innovations. This is particu-

*(Continued on Page 25)*

# The Game in England

## Our Friend Leslie Eveleigh Hints at New Lighting Source Eliminating Electricity

WRITTEN FOR THE AMERICAN CINEMATOGRAPHER BY LESLIE EVELEIGH

[*The author of this article spent the whole of the winter of 1925-26 over here, during which time he made a complete survey of the technical end, incorporating his observations in 14 special articles to the English Trade Paper "The Bioscope." At one of our meetings he addserred the Society on "Conditions in England," and now in the following article he shows us how things have changed over there since his return to his own country.*]—EDITOR'S NOTE.

When I had the honour, in January, 1926, of telling the American Society of Cinematographers something about conditions as they were then in this country, I pointed out that there were only three well-equipped studios here. That was two years ago. Even while I was talking then, J. D. Williams had conceived the first really large studio to be built especially for the production of motion pictures and was setting about carrying out his concept. Hitches and delays occurred, but eventually the British National Studios, at Elstree, were an accomplished fact—and J. D. Williams left. This building with its two stages 300 feet long by 100 feet wide began to give the people over here some little idea of the kind of studios which are taken for granted in the States. But—British production was languishing.

**Leslie Eveleigh**

Then came definite talk of the Quota Bill, and as soon as realization came that this would be a certainty things began to happen. Capital was forthcoming for the production of better pictures than this country had ever before turned out. Directors and technicians generally, who had, up to this time, been starved for lack of adequate capital, took hold of their new opportunities with both hands, and startled everyone by showing that they **could** produce results, provided they had the facilities. New equipment was bought and installed in the older studios and more up-to-date equipment was added to the three studios about which I told you when I was over among you. New directors brought fresh ideas and a new type of picture was evolved. As the Quota Bill neared its consummation in Parliament new organizations came into existence with schedules for building new studios in and around London.

By the time these lines are in print another crop of new companies with projects for the building of new studios will be in existence, and the Quota Bill will be a **fait accompli.** The year 1928 will see such an amount of production as has never yet been known in this country, for, apart from the necessary capital being forthcoming, the authorities here have at long last awakened to the fact that pictures cannot be produced without facilities, and it must be said that with the realization of this a very generous granting of the necessary facilities has been made.

Plans are on foot by various companies to invite successful directors, stars and cinematographers over from Hollywood to help us to make the pictures necessary to fill the quota, at the same time our own technical boys are advancing by leaps and bounds in response to the influx of new equipment and new facilities. Some really excellent technical work has been turned out within the last six months.

The use of Panchromatic stock is becoming more general, several studios are incorporating incandescent lighting units mixed with their ordinary arc equipment, and I, personally, have been engaged, in conjunction with a well-known professor over on this side, for the last nine months upon experiments with a new lighting source altogether.

This new lighting source aims at cutting out electricity altogether, and is nearly excluisvely designed for use with Panchromatic stock. Should the final experiments (which we are hoping to carry out within the next month) be successful, I hope to let the A. S. C. know all about it in my next letter.

I do not know if the new Agfa super-Panchromatic stock has reached the U. S. A. yet, but we are using it over here with excellent results. With this stock it is possible to obtain very effective results at night with ordinary street lighting; certain interior effects with the normal lighting which would be in this particular interior and for night shots on locations it is invaluable.

This absorption of part of the German motion picture technique is going on in several other directions over here, which is all to the good of picture making in this country. One branch, however, which both Germany and yourselves employ extensively, the use of mechanical miniatures, is very nearly ignored. Why this should be so is difficult to ascertain because so much production expenditure can be saved by this means. However, with the advent of the new studios we shall probably see several of these units spring into existence.

Altogether, 1928 presents a brighter outlook to the people engaged in the production of motion pictures on this side of the Atlantic than ever before in the histtory of the game.

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# Incandescents

Considerable attention is now being given to use of incandescent lamps for lighting motion picture sets.

Heretofore the studios have neglected this class of lighting due to the general opinion that it was not a suitable light source and deficient in the qualities required.

The general improvement in incandescent globe design and the recent introduction by Mole-Richardson, Inc., of Hollywood, of a special line of equipment adapted to give a very flexible application of this form of lighting has caused a marked change of opinion throughout the studios.

Many recent pictures, including "Dress Parade," "A Texas Steer," "13 Washington Square," "Rose of the Golden West," "The Leather Face" and "On the Tonto Rim," have been made entirely or in part with incandescent lighting.

The Caddo Company, at Metropolitan Studios, now making "Hell's Angels" are using the Mole-Richardson equipment.

Tony Gaudio, A. S. C., and Harry Perry, A. S. C., working with highly sensitized panchromatic stock, are obtaining excellent effects.

This is all of considerable import to the profession as it will give wider range to the cameraman and greater production economy to the producer.

We take this opportunity to express our appreciation for the pioneering work of Mole-Richardson, Inc.

# Amateur Cinematography

## A Professional's Notes for Amateurs—XVI

By JOSEPH A. DUBRAY, A. S. C.

*(Continued from January Cinematographer)*

From the expression of depth of focus of a photographic objective, as analyzed in the preceding chapter, we deduce that DEPTH OF FOCUS is dependent upon the following attributes of an objective.

1—Its focal length. 2—Its aperture. 3—The distance of the object plane brought to focus. 4—The chosen limit of permissible unsharpness defined by the size of the disc of confusion.

As photographic objectives used in motion picture work are well corrected in regard to spherical aberration it is possible, for practical use, to find, through a simple operation their depth of focus, and conversely to find at which aperture the objective must be worked to obtain a certain desired depth.

**Joseph A. Dubray**

When an object **at infinity,** for instance an object which is in the extreme distance of a landscape, another object much nearer the camera can be found to present sufficient sharpness without altering the "focus" of the camera. The distance from the lens to this nearer object is called the **Hyperfocal Distance.**

It is evident that the hyperfocal distance is dependent upon the aperture of the lens and upon the size of the disc of confusion that is chosen as the permissible limit of sharpness.

Practical experimentation has been instrumental to the writer for following Mr. F. R. Fraprie's suggestion that a smaller disc of confusion is to be chosen for the shorter focal length, the disc being made larger as the focal length increases.

The following table gives the size of the disc for different focal lengths as used by the writer with infallible success:

| Focal Lengths in Inches | Size of Disc in Inches |
|---|---|
| From 1 to 3 | 1/400 |
| From 3½ to 4½ | 1/300 |
| From 5 to 7 | 1/250 |
| From 8 to 9 | 1/200 |
| From 10 to | 1/150 |
| From 11 to 12 | 1/100 |
| From 13 to 16 | 1/75 |

To ascertain the Hyperfocal Distance of a photographic object, square the focal length, multiply by the size of the disc of confusion and divide by the aperture, or F. number at which the objective is worked for a specified scene.

For example: While using an objective of 2-inch focal length in an exterior scene to be photographed at an aperture of F.8, it is desired to know at what distance from the camera an object will be sufficiently in "focus."

The square of 2-inch is 4: According to the table, 1/400 of an inch is the size of the disc of confusion chosen for a 2-inch objective; 4 multiplied by 400 equals 1600, which divided by 8 (the F. number) gives 200 inches or 16 feet and 8/10ths. In such cases all objects from approximately 17 feet to infinity will be sufficiently sharp so has to be called "in focus" following the vernacular expression.

It is evident that for each point in the object space that is critically focused by a given objective, there exists a NEAR and a FAR point which present a sharpness within the limits of the chosen disc of confusion. These two points represent then the limits of depth of focus which cannot be surpassed without obtaining an image of objectionable unsharpness.

Once the hyperfocal distance is known, the **near** and **far** distances for any chosen point of an object, may be found thus:

The **near** distance by multiplying the chosen object distance by the hyperfocal distance of the lens and dividing the result by the same hyperfocal distance **plus** the chosen object distance at which the lens is critically focused.

The **far** distance by multiplying, as before, the chosen object disatnce by the hyperfocal distance of the lens and dividing the result by the same hyperfocal distance **minus** the chosen object distance at which the lens is critically focused.

Suppose for instance a scene critically focused at 12 feet with a 2-inch lens at an aperture of 5.6; The **near** distance would hten be

$$\frac{24 \times 12}{24+12} = 8 \text{ feet.}$$

and the **far** distance would be

$$\frac{24 \times 12}{24-12} = 24 \text{ feet}$$

Such scene would therefore be sufficiently sharp in all planes between 8 and 24 feet for a disc of confusion of 1/400 of an inch.

Following the above data, it results quite easy to prepare tables of depth of focus which would at a glance give the **near** and **far** distances and consequently the aperture that should be used for obtaining a certain desired depth of focus.

Such tables should prove very useful to the adept in cinematography, especially when we consider the great aperture of the objectives generally used in motion picture photography. Such tables become indispensible for hand cameras which do not present the convenience of a focusing ground glass.

Dr. Rudolph has recently expounded the opinion that focal length and the aperture of the objective are not the only factors upon which depth of focus is dependent. The eminent scientist points to his Plasmat objective as possessing a greater depth than other lenses of equal focal lengths are creditd to possess for the same aperture.

It is claimed for this lens that an improved color correction raises the Plasmat to the grade of Sphero-Achromats with the result that it has a greater sharpness of depth.

Dr. Rudolph has constructed a new depth testing object which is discussed in detail in N. 20, 1921, of the Photographic Review, tending to prove his contention.

It appears, however, that the scientific world is still awaiting for more satisfactory proof of the case, although the greater depth of the Plasmat objectives is practically considered as a true fact.

Dr. Rudolph's contention will undoubtedly stimulate the manufacturers of objectives to carry an extensive investigation of the question and its merits.

The aperture of an objective is also the factor that controls the quantity of light admitted to form an image and therefore controls the intensity of illumination of the image, which in turn controls the exposure which is necessary to produce an image on the sensitive material of the plate or film.

The aperture of an objective is controllable by means of a diaphragm which is usually constructed so

*(Continued on Page 31)*

# The Lubrication of Motion Picture Film

By J. I. Crabtree and C. E. Ives

Communication No. 330 from the Eastman Kodak Research Laboratories.

(Continued from January Cinematographer)

The above experiments serve to emphasize the importance of applying the correct quantity of wax to the film and of removing at very frequent intervals any wax which accumulates on the projector gate.

**Lubrication of the Entire Gelatin Surface of Motion Picture Film**

At the outset it was considered that by coating the entire gelatin surface of motion picture film with a thin layer of a suitable lubricant, many of the objections to edge lubrication would be overcome. Also, if the coating could be made impermeable to oil, trouble from oil spots would be eliminated likewise.

The idea of lubricating the entire gelatin coating of the film is by no means new. A large number of patents have been granted for particular lubricating formulas which include the use of tallow, lard, spermaceti, stearic acid, sodium stearate in methanol, oil of turpentine, olive oil, cotton seed oil, linseed oil, petrolatum, a suspension of gypsum in menthanol, beeswax, and paraffin wax.

Before the commencement of the experiments described below, the Dworsky Film Mfg. Co. was supplying a film buffing machine shown in Fig. 9. This consists

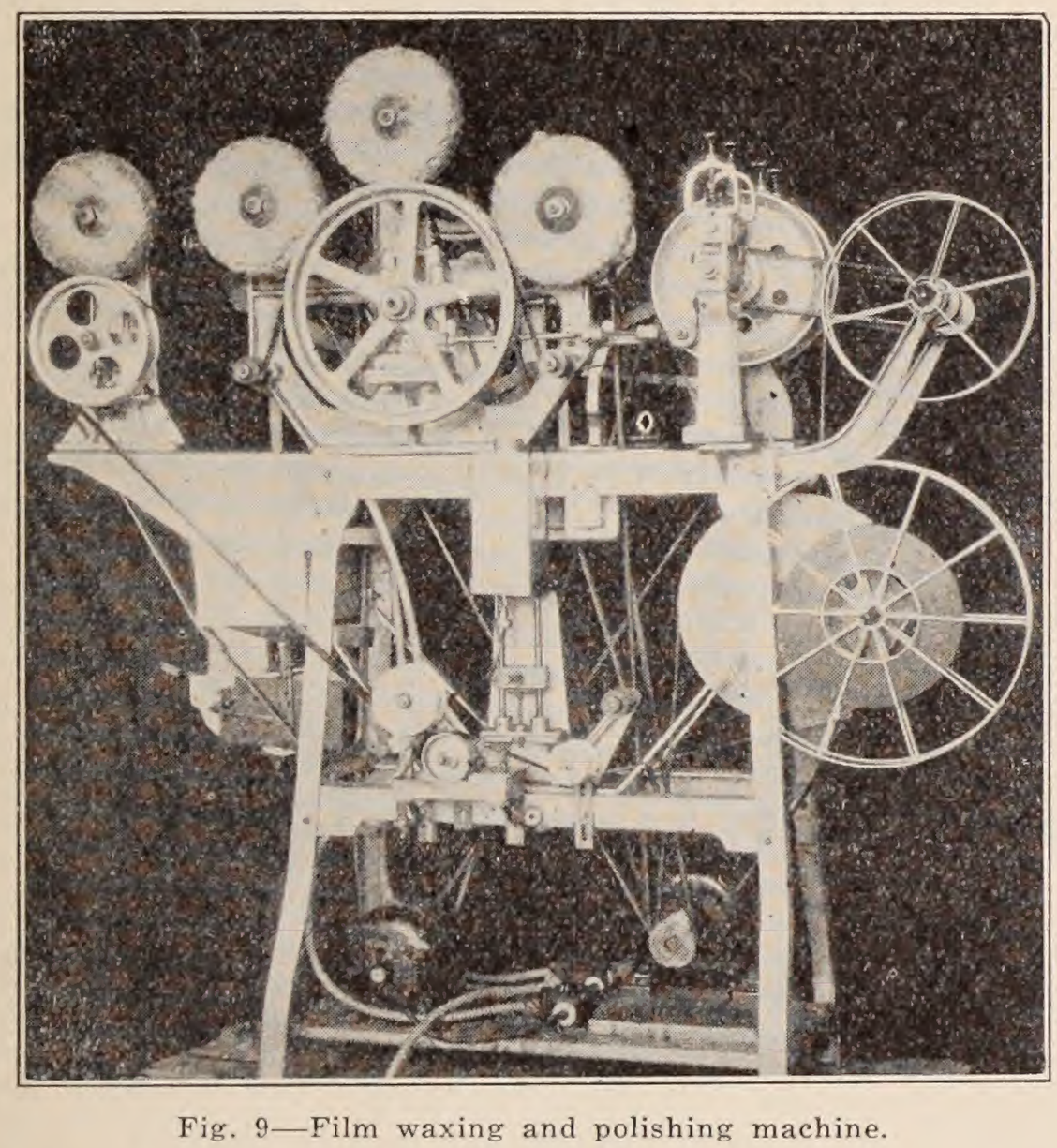


Fig. 9—Film waxing and polishing machine.

essentially of a series of four or five cloth buffing wheels similar to those used for polishing electro-plated metals, which buffers rotate at a high speed in contact with the gelatin surface of the film. The film is pulled through the machine by means of two rubber covered rollers of the laundry wringer type, the machine being entirely sprocketless. (The lower application roller attachment was not originally fitted to this machine). Usually a little tripoli (polishing powder) was applied to the buffers to produce more rapid polishing of the film surface.

Although it might be expected that this buffing treatment would tend to scratch the gelatin surface, this was not found to be the case. Instead, the treatment produced a noticeable gloss on the gelatin surface (see Fig. 5 as compared with Fig. 4).

Projection life tests made with buffed and unbuffed film indicated that the buffing treatment was of questionable value. However, the machine appeared to be readily adaptable for the application of lubricants to the entire film surface and the following experiments were therefore made.

1. Machine oil or Russian mineral oil was applied to the entire gelatin surface and then buffed in the above manner. Projection tests indicated that film so treated had a projection life comparable with that of edge waxed film, although after storing in the rolled up condition for two or three days, the film developed oil spots. Attempts were made, therefore, to find a solid lubricant which would be impervious to the effect of oil.

2. Waxes were next applied to the film surface by holding a piece of solid wax against the first buffing wheel, which in turn applied the wax to the film. The remaining buffers then spread out the wax more evenly and imparted a high gloss to the film surface which resembled that of highly polished footwear.

Projection tests with film waxed in this manner with various waxes indicated that there is a wide difference in the lubricating quality of different waxes. Data regarding this will be given later. Oil treatment tests after waxing indicated that a surface coating of almost any wax over the gelatin surface of the film will materially reduce the propensity of the film to show oil spots on the screen.

**Mechanical Methods of Applying Wax to the Film**

(A) It was soon apparent that the above method of application of the wax was entirely impracticable and that a mechanical method of application was required. The application roller method of applying a solution of various waxes in suitable solvents was tried out and this was ultimately entirely satisfactory.

The first arrangements of application rollers is shown in Fog. 10. The wax solution is contained in tank

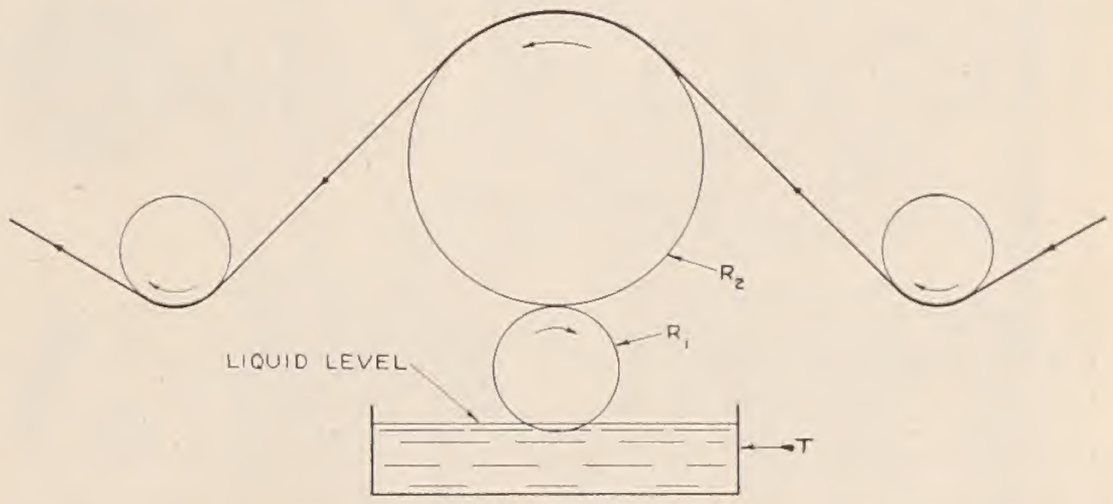



Fig. 10—Showing method of application of wax solution to film surface.

T in which a small flangeless aluminum roller R1 covered with felt rotates. Roller R1 bears against roller R2 which is covered with silk plush. The film runs face downwards against roller R2 and rotates it and in turn this roller rotates the lower roller R1 which is immersed to a depth of about ¼ inch in the wax solution. By adjusting the distance between the rollers R1 and R2, roller R2 acts as a wringer and squeezes the excess wax solution from roller R1 so that the quantity of liquid applied by the plush coating of roller R2 can be regulated.

This method of application had the objection that the plush did not apply the wax solution sufficiently evenly and it was not possible to control the quantity of wax applied with sufficient precision to insure that the wax solution did not pass through the perforations on to the base side of the film.

(B) An entirely satisfactory mechanism for applying the wax solution is shown in Fig. 11. The film

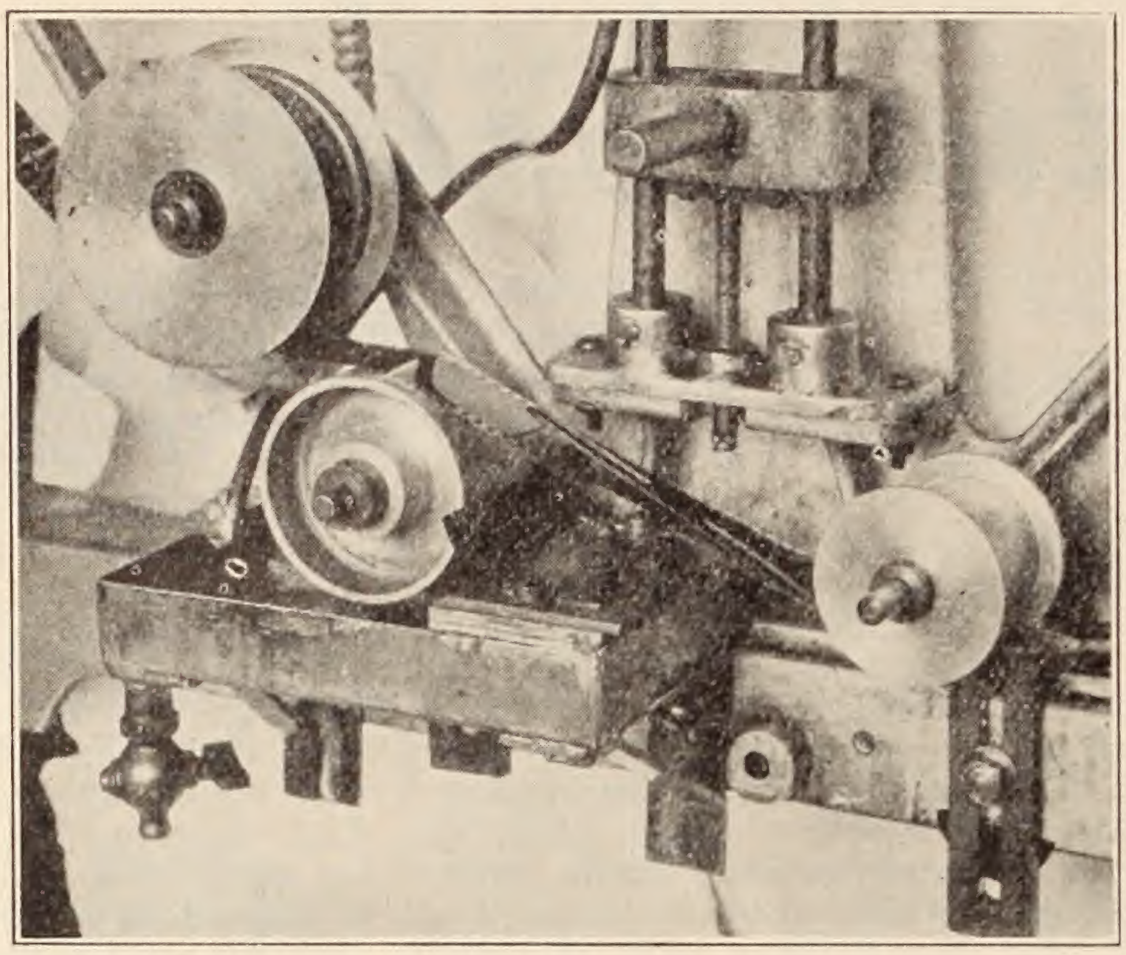


Fig. 11—Application roller for applying wax solution.

passes gelatin side downward over the polished aluminum roller R1 (about 2½ inches diameter) which dips in the wax solution at room temperature in tank T to a depth of about ¼ inch. The excess wax solution is removed from the surface of the roller by means of a "doctor" S consisting of a sheet of thick paper on ordinary motion picture film. This leaves an extremely thin layer of wax solution on the roller which is applied to the film surface at P. The friction between the roller R1 and the film is sufficient to drive the roller R1 without danger of slippage. This friction can be increased by lowering the idler roller R2 in relation to roller P.

The latest type of Dworsky buffing machine is shown in Fig. 12. This is shown fitted with application

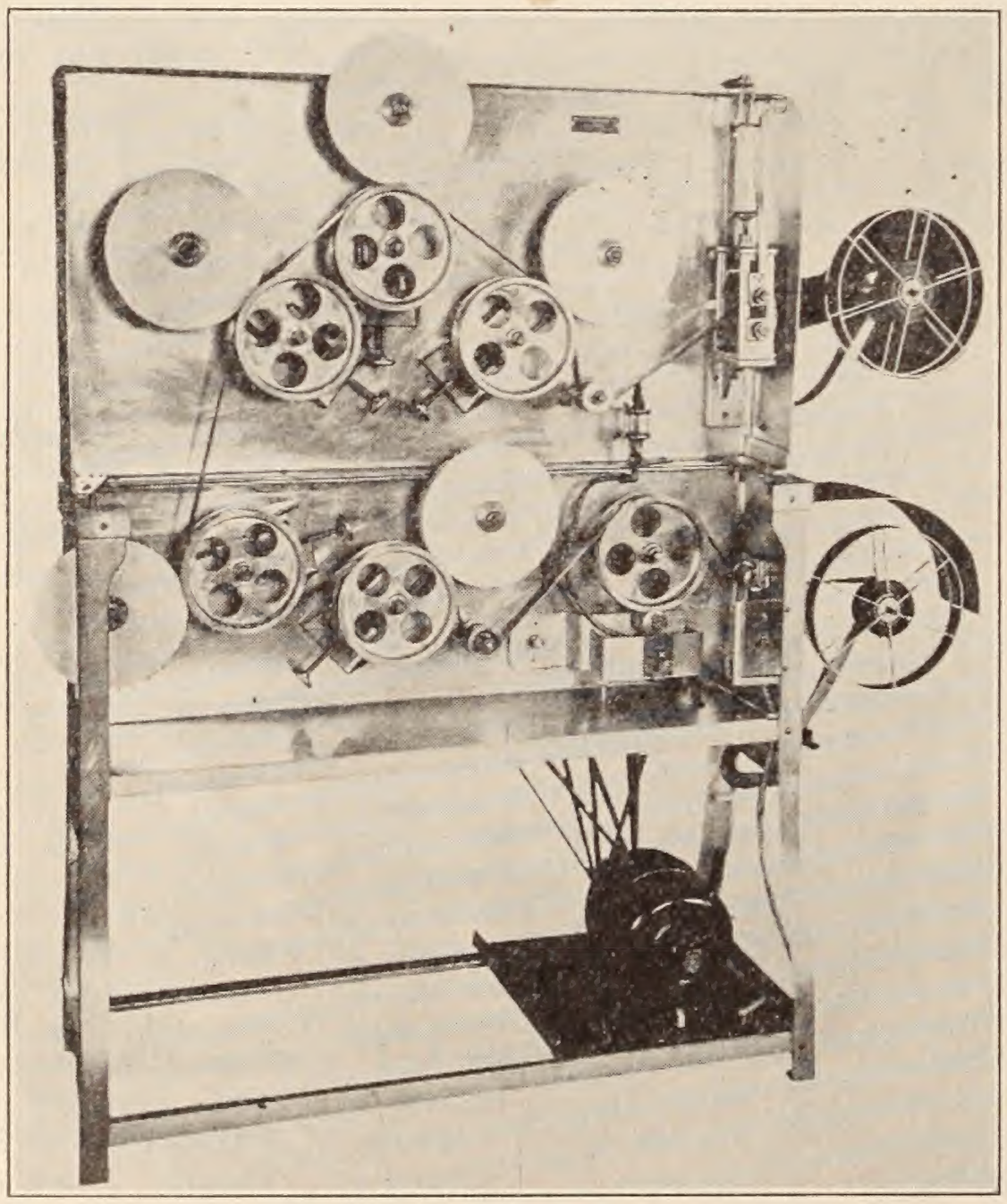


Fig. 12—Improved type of waxing and polishing machine.

rollers as first developed by the authors. It is suggested that the single application roller shown in Fig. 11 be fitted to the new type machine.

### Manipulation Details

Although at first sight the waxing machine appears somewhat complicated, it is very simple to operate, does not get out of adjustment, and requires little or no attention other than changing of the reels. The level of the wax solution is maintained constant by means of an inverted bottle or can fitted with a tube dipping into the tank of liquid. The depth of the liquid is then at all times equal to the distance between the tube orifice and the bottom of the tank which holds the liquid. The film travels at the rate of six to twelve inches per second, the six inch speed giving a more desirable polish to the film surface. A roll of one thousand feet is, therefore, waxed in from fifteen to thirty minutes.

About two ounces of liquid are required per one thousand feet of film providing the exposed surface of liquid in the tank is covered as far as possible to prevent evaporation.

The rubber rollers at A (Figs. 9 and 12) should be celaned at intervals by holding a cloth moistened with carbon tetrachloride against the surface so as to remove tracts of lint.

After waxing it is desirable to rewind the film while passing it between the folds of plush so as to remove occasional particles of lint which tend to adhere to the film after polishing.

It might be considered that the film would ignite from the heat developed by friction perchance the film should remain stationary in contact with the rotating buffers. Tests indicated that the film did not fire after remaining stationary in contact with the buffers for thirty minutes.

### Choice of Waxes and Solvents

The following waxes were tested: beeswax, cantol wax, candelilla, carbnauba, Japanese, Johnson's floor wax, montan, hard paraffin, and Simoniz wax.

The choice of suitble solvents is somewhat limited because as pointed out in a previous paper,[2] many solvents have a tendency to attack the silver image and are therefore unsuitable. The three solvents, benzene, gasoline, and carbon tetrachloride were used in the preliminary tests. Since carbon tetrachloride is non-inflammable and when pure has no harmful effect on the film, this solvent was used exclusively in the later tests.

2. "Film Cleaning Liquids for Motion Picture Flm" by J. I. Crabtree and H. C. Carlton, Trans. So. M. P. Eng., No. 30, 277 (1927).

### Properties of Motion Picture Film With a Coating of Wax over the Entire Gelatin Surface

#### 1. The Projection Life as Compared with Edge Waxed Film.

Comparative measurements were made on the projection life of the various samples of waxed film as follows: The ends of six-foot length of each sample of film were spliced together so as to form a loop and this was run continuously through a Powers projector maintained as nearly as possible under standardized conditions. The gate spring tensions were checked at regular intervals, and the machine otherwise maintained in first class condition. If any incrustation tended to form in the gate, this was indicated by a distinctive noise and the incrustation was at once removed. The number of times which the film passed through the machine was recorded by a counting device and projection of the film was continued until the perforations became torn to such an extent that the film would no longer pass successfully through the machine.

Assuming a basis of 100% projection life for normally processed film which was not treated in any way before projection, the results of tests with fiums lubricated over the entire surface with various waxes were as follows:

| Nature of Wax or Oil Solution in Carbon Tetrachloride | Projection Life | |
|---|---|---|
| Plain film (untreated) | 100% | 10 |
| Montan 1% | 77% | |
| Montan 5% | 94% | |
| Turpentine | 100% | |

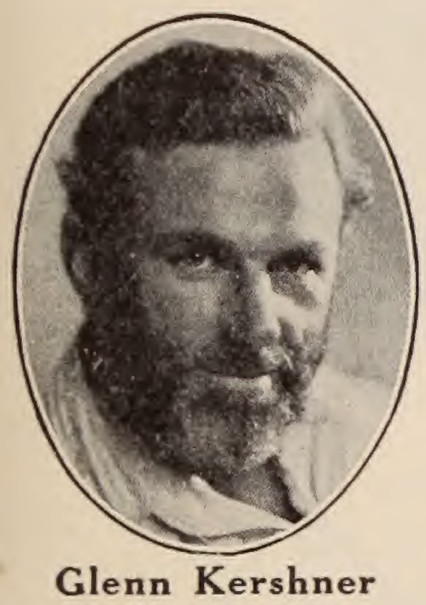
*(Continued on Page 27)*

# *Shooting the Colorado*

*By* GLENN KERSHNER, A. S. C.

After that wild ride down the Colorado River, it was a pleasure the other evening to attend the A. S. C. meeting and be with a bunch of cameramen who are doing hazardous things each day. This trip was so different from all others I have taken that I would like to tell the readers of The Cinematographer how thirteen of us went from Green River, Utah, down the Green River and Colorado River, through the Grand Canyon to Hermit Rapids.

We used six boats; four were eighteen feet long and two were sixteen feet long. These were wonderfully built boats, made with two water tight compartments and only a cock-pit in the center of the boat big enough for the oarsman. In the end of these water-tight compartments were air-tight cans to keep the boat afloat even though one compartment should be crushed. The hatches on these water-tight compartments were bolted down on rubber gaskets. It was in these compartments that we successfully stored tons of equipment, supplies, bed sacks, etc.



**Glenn Kershner**

One of the boats was filled with radio equipment of the United States Army, but owing to some unknown conditions they were unable to work in Cataract Canyon at all, which cut off our communication with the outside world.

While all the newspaper headlines and radios were broadcasting that we were lost and given up I was right down there bobbing up and down on an ice-covered boat, which showed a disposition to be the longest under-water diver I ever succeeded in riding, and I must confess that that river has little respect as to whether one's "undies" are of silk or wool, for after shooting each rapids we were forced to build a fire and dry them.

Cold weather caused low water which made many more rapids than have been found before. Low water meant many more rocks which caused us to make but few miles a day, when we were scheduled to make many. Many times we had to portage everything and let the boats through with ropes and at one time even the boats had to be picked up bodily and carried on our shoulders over and around acres of rocks.

These unexpected delays put us many days behind causing our cook to use careful judgment in reducing our daily rations. The scenery was very impressive on the Green River, while the walls and many rapids of the Cataract Canyon were wonderful. We pictured the boats shooting these many rapids.

The trip from Lee's Ferry was the prize winner, boats turned over, men struggled in the rapids; time and again we came to walls rising straight up out of the river thousands of feet where the waters rushed with terrific force. At times we found no driftwood for fires which caused us much discomfort being unable to warm ourselves or dry our clothes.

At times sand storms were so severe that we had to find shelter in holes and among the crevasses in the rocks. The narrow canyons soon became dark and cold and the boats being covered with ice made them slippery to hold on to.

Then came those awful Soap Creek, Socdologer and Grape Vine Rapids that have claimed so many already. They seemed possessed to claim every man and boat as we struggled through those mountains of icy water.

During the trip we made short stays at Dark Canyon on Thanksgiving Day; repaired and restocked grub at Lee's Ferry; rested up at Phantom Ranch and then joined Elmer Clifton at Hermit Creek Rapids where he was directing the main company in "The Bride of the Colorado" for Pathe-Bray.

After shooting a week or so we traded our boats for mules and came up to the El Tovar Hotel in knee deep snow and I was home for Christmas Eve, a very happy man to be back with my family and friends although the children did not recognize me at first with my two months' crop of whiskers.

In summing up the trip it was wonderful—the scenery so beautiful it is beyond my vocabulary to describe it, and the pictures are gorgeous. I used Panchromatic negative which gave me all the gradations of the spectrum. Filters played a very important part as the Grand Canyon is like the rainbow itself.

Glenn R. Kershner, A. S. C., who photographed the Pathe-Bray Colorado River expedition, with his camera ready to shoot the deadly Soap Creek Rapids

The party, now called "The Lucky Thirteen" was composed of Leigh Smith, Director; E. C. LaRue, Glenn R. Kershner, Pat Gannon, John Shubert, Sargeant Herrick, Bob Barber and the boatmen were Nick Samoff, Val Woodbury, Con Rodin, Owen Clark, Dean Daily and Frank Dodge, head boatman. As a party we had a wonderful time but would hardly care to repeat such a hazardous trip under such awful conditions.

---

# *A Gift to the Industry*

Armin Fried, camera technician, and Norman DeVol, Akeley specialist of the Fox Studios, have recently made a contribution for the good of the industry in the way of a roller pressure plate for the Akeley Camera which is so efficient that it practically eliminates all waste caused by scratches and abrasions in the handling of film. This clever device can be easily adjusted to almost all the machines used in the production of finished pictures as Bell & Howell printers, Testing Machines, Polishing Machines, Measuring devices, etc.

The inventors call the new device, which they generously give to the industry, a roller pressure plate, and by applying it to the Akeley they have succeeded in eliminating aperture scratches 100%.

This roller pressure plate is of a very simple design. It consists of two tracks pressing on the edges of the film and two steel rollers holding the film straight in front of the aperture. An added feature is that the roller bearings in which the rollers revolve are not round but triangular and act as a three point bearing; therefore the rollers have no tendency to stick.

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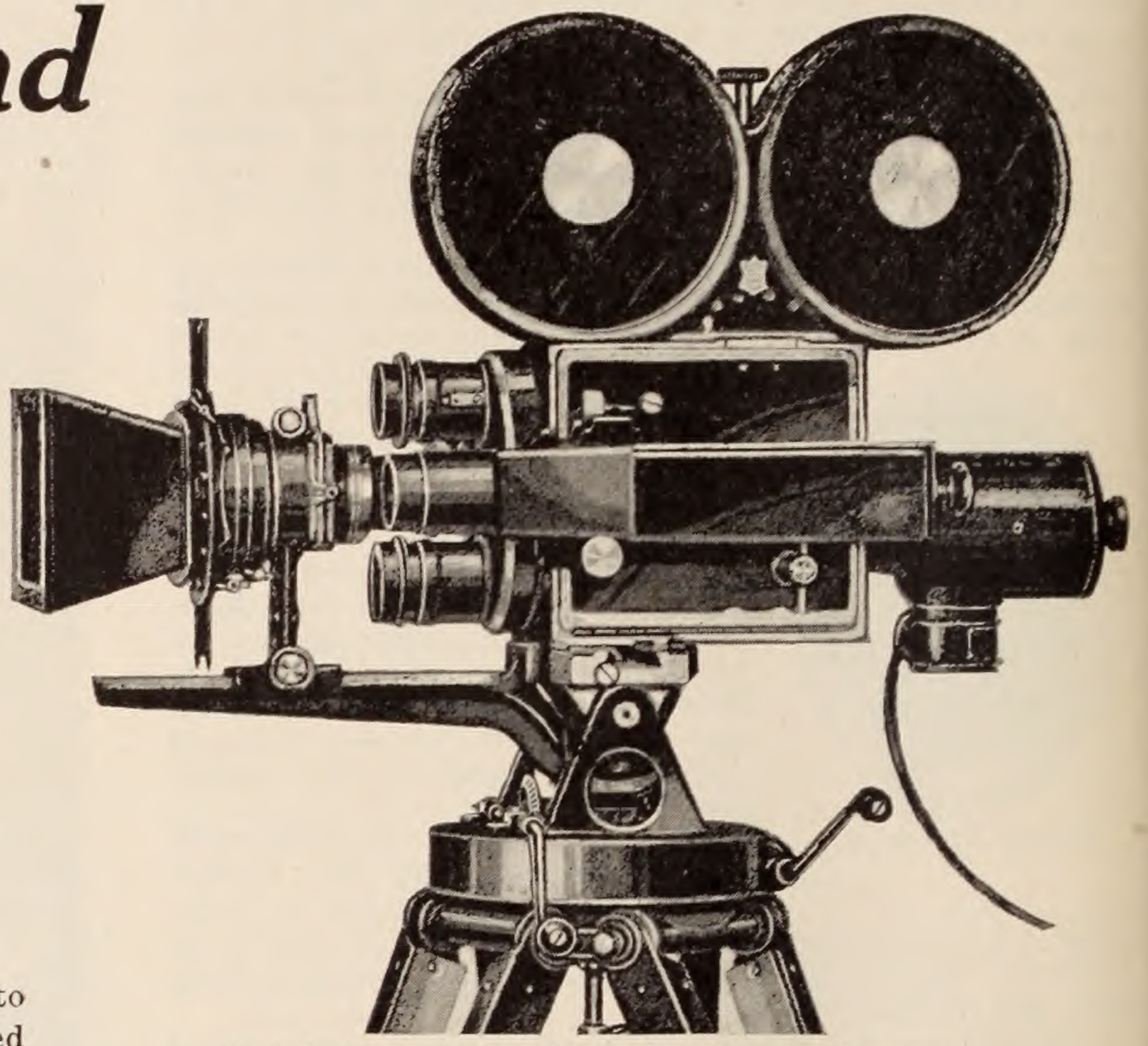

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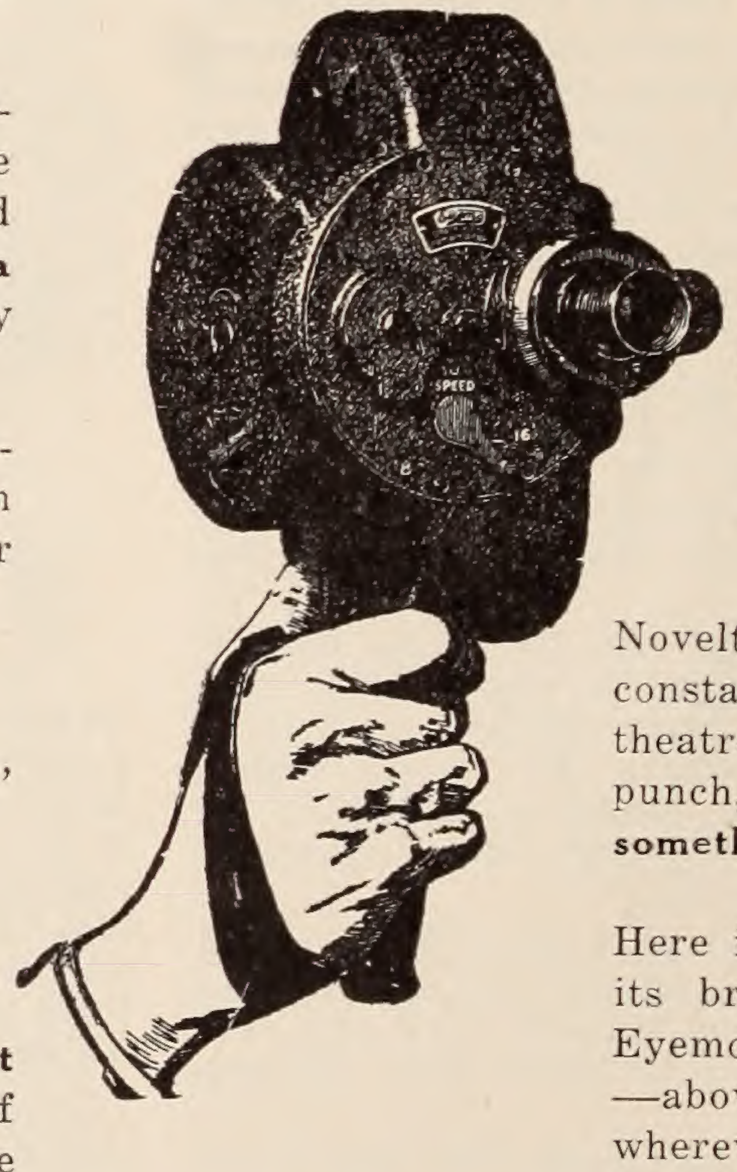

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# *A New Pressure Plate for the Akeley*

*By* IRA B. HOKE, A. S. C.

Since entering the independent Akeley field some two years ago it has been the aim of Mr. John W. Boyle and myself to perfect the aperture plate and pressure race of the Akeley camera in some manner to insure freedom from celluloid scratches under any adverse conditions.

Very early in the game we discovered that, while the Akeley pressure gate gave no trouble when operated under favorable conditions, the moment the camera was subjected to a dusty, dirty or windy location scratches were likely to appear.

Every operator of the Akeley has undoubtedly met with an experience similar to ours. We first went over the magazines and tested them minutely for the slightest sign of abrasion and found none. We then went through the period of short loops, long loops and the standard loop; finally adopting the last as most satisfactory. We tried different methods of loading. We lined the magazines with velvet and as the scratches still appeared decided there was nothing left but the pressure plate to experiment on.

To make a long story short we finally discovered that when a tiny grain of sand, dust or similar matter was carried from the unexposed portion of the film, either from within the magazine or between the magazine and the pressure plate, almost invariably it became lodged between the film and the steel pressure plate just above the aperture line.

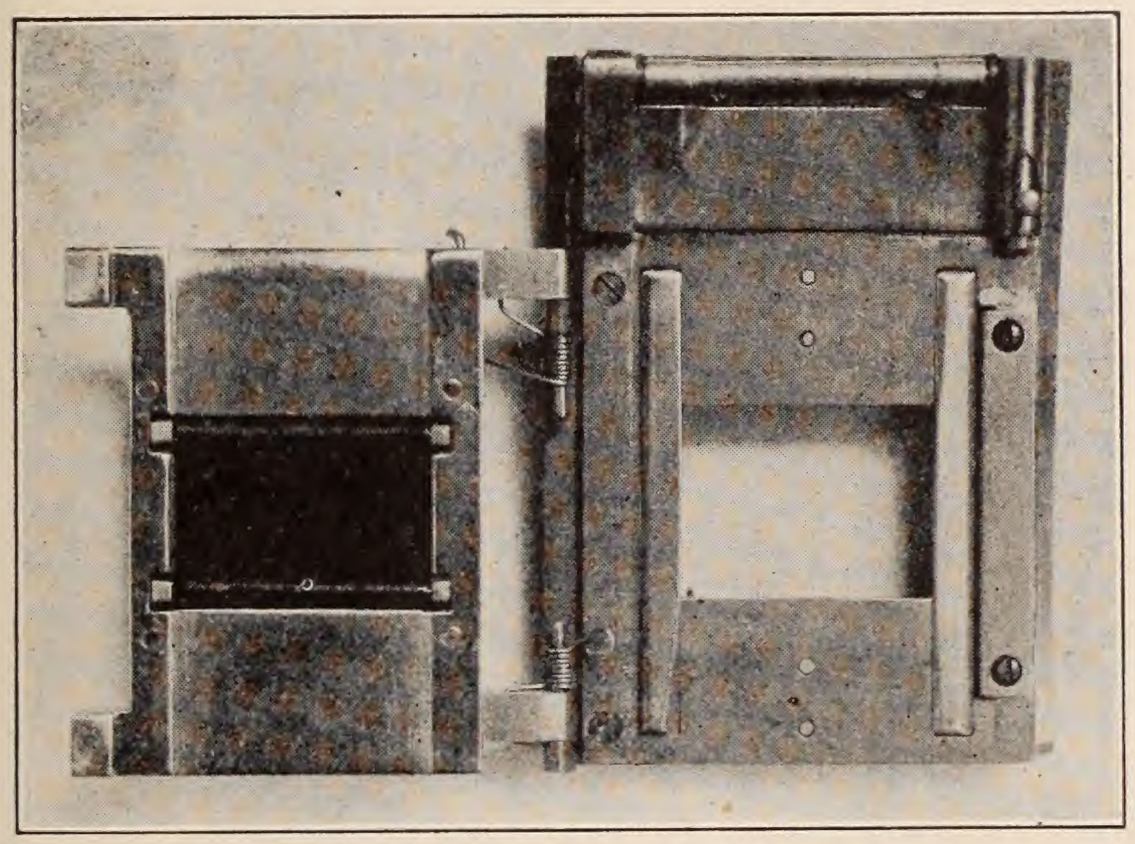

Figure 1.
Gate open showing portion milled away and method of placing ebony rollers across picture area. At the top is steel roller designed to relieve the drag on the emulsion side of the top loop.

Now a foreign substance, however minute it may be at the beginning, does not behave like the proverbial "rolling stone" when it is pinched tight against the rapidly moving celluloid surface and a steel plate. Once let a particle stick to the plate and within a few feet it gathers enough celluloid to become quite a promising scratch within the next twenty or thirty feet.

I used to open the gate after each scene to look for pick ups and found plenty of them whenever there was an excuse of dust on the location. Well, that was the solution to the problem so far. Next we borrowed a little wisdom from our memory of an old adage—"A rolling stone gathers no moss"—and something more from past experience of successful roller pressure plates on the DeBrie and other earlier cameras. When we put two and two together we found the most obvious way to make four out of it was to take our pressure plate to Mr. George Mitchell of the Mitchell Camera Company who has embodied in his new speed movement the most modern cousin of the old roller pressure plate.

After some weeks Mr. Mitchell turned over to us a simple adaptation of the Mitchell Camera ebony rollers embodied in the regular Akeley plate. These rollers which are made of ebony with a steel core are set inside the aperture line itself and bridge across the picture area of the film. The front pressure shoes are replaced with stainless steel of the same design as the original. At the top of the gate member a steel roller is placed to take the loop on the emulsion side instead of the original cutaway which had a drag on each side where the perforations touched.

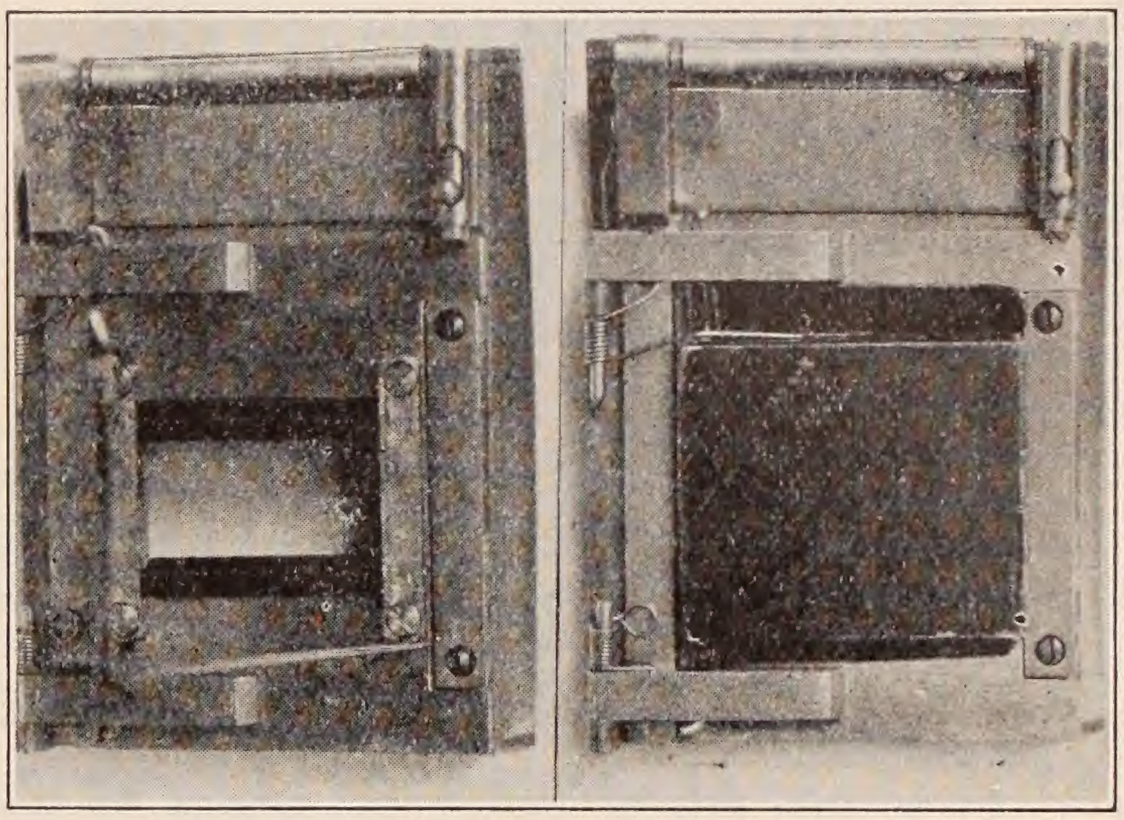

Figure 2.
Gate closed showing bearing bridges which support the ebony rollers. Also trap door designed to minimize light reflections.

As the redesigned plate now sets in the camera there is nowhere a drag on either the front or back of the film within the area ultimately to be occupied by the picture. The old steel gate has been milled away in the center to a depth of 1/64 of an inch. The sides over the perforations remain as originally designed and the two ebony rollers are raised to that level, thus forming a focal plane rigid and exact but not a sliding pressure anywhere. Sand particles coming down with the film touch the rollers and are passed harmlessly by them without a chance of scracthing.

This plate has been in use for some time under any number of different conditions always with gratifying results. In one instance while on location with Christies' production "Tillies' Punctured Romance" I encountered three days of sandstorm during which time sand was sifted into literally every piece of equipment I carried. The film came through the camera in perfect order and I attribute not a little of the success to the Mitchell roller plate.

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Marshall, Chas. A.—M.-G.-M.
Marzorati, Harold J.—M.-G.-M.
Mason, Harry G.—
Novak, Jos. J.—Universal.
Olsen, R. B.—
Ramsey, Ray Lloyd—Universal.
Rand, William—Lasky.
Roberts, Josiah—M.-G.-M.
Shackelford, J. B.—Lasky.
Sickner, William—First National.
Stout, Archie J.—Lasky.
Steene, E. Burton—Caddo Prod.—Met. Studio.

## NEWS CINEMATOGRAPHERS

Grimes, William H.—M.-G.-M.
Parrish, Fred—Fox, Colorado Springs.
Staub, Ralph B.—Columbia, Specialties.

## STILL PHOTOGRAPHERS

Alexander, Kenneth—United Artists—D. W. Griffith.
Archer, Fred R.—De Mille.
Fryer, Elmer—De Mille.
Kahle, Alexander—De Mille
Mannatt, Clifford—M.-G.-M.
Parker, Robt. M.—Stull Prod.
Richee, Eugene Robert—Lasky.
Rowley, Les—Lasky.
Stapp, W. B.—
Sigurdson, Oliver—Metropolitan Studio.
Thomas, Wm. E.—De Mille.
Van Rossem, Walter J.—James Cruse, Inc., Met. Studio.

## SECOND CINEMATOGRAPHERS

Bader, Walter S.—M.-G.-M.
Bauder, Steve L.—M.-G.-M.
Baxter, George—De Mille.
Bennett, Monroe—
Borradaile, O. H.—Lasky.
Chaney, George—United Artists.
Chewning, Wallace D.—M.-G.-M.
Cunliffe, Donald—Universal.
Davis, Leland E.—
Doolittle, Jas. N.—First National.
Drought, Jas B.—Universal.
Dunn, Linwood G.—Metropolitan Studios.
Dyer, Edwin L.—
Fitzgerald, Edward—M.-G.-M.
Giridlian, Jas. N.—F. B. O.
Greene, Al M.—Technical Art.
Greenhalgh, Jack—F. B. O.
Guffy, G. Burnett—De Mille.
Haas, Walter—
Harten, Charles—New York.
Head, Gordon G.—
Hendrickson, Fred S.—Lasky.
Huggins, L. Ovens—
Jenkins, John—
Julian, Mac—
Keyes, Donald B.—
Landrigan, John S.—Lasky.
Lang, Charles Bryant—Lasky.
Longet, Gaston—F. B. O.
Lanning, Reggie—Lasky.
La Shelle, Joe—
Laszlo, Ernest—
Lindon, Curly—
Martin, Robt. G.—F. B. O.
Marta, Jack A.—Fox.
Merland, Harry—Lasky.
Mols, Pierre M.—M.-G.-M.
MacLean, Gordon—M.-G.-M.
Nogle, Geo. G.—
Pahle, Ted—
Palmer, Robt—M.-G.-M.
Parsons, Harry—
Pittack, R. W.—Lasky.
Planck, Robt. H.—Columbia.
Prince, Al—Universal.
Pyle, Edwin L.—
Ragin, David—Fox.
Ray, Bernard B.—
Redman, Frank—DeMille.
Reed, Arthur—M.-G.-M.
Rees, Wm. A.—Fine Arts.
Schmitz, John J.—Special Process
Schopp, Herman—Metropolitan Studios.
Shepek, John, Jr.—Educational.
Silver, John—
Smith, Jean C.—De Mille.
Stine, Harold E.—De Mille.
Tappenbeck, Hatto—Fox.
Trezo, Fred—Universal.
Thompson, John—F. O. B.
Unholz, George—Sennett.
Van Dyke, Herbert—M.-G.-M.
Van Enger, Willard—Warner Bros. Vitaphone.
Wagner, Robt—First National.
Walters, Joseph J.—F. B. O.
Westerberg, Fred—De Mille.
Wilde, Harry—
Williams, Alfred E.—Lasky.
Rex, Wimpy—Lasky.
Witzel, E. L.—Universal.

# Developer Perfected

## Mr. Roy Hunter, Director of Universal Film Laboratories, Reports Revolutionary Advance in Development of Motion Picture Negative Film

[*In the December issue of THE AMERICAN CINEMATOGRAPHER Mr. Frank E. Garbutt of the Paramount Laborities, expressed his belief in the advent of the developing of negative films by machine and gave an expose of the work conducted by him and his associates in this line of endeavor. The Universal Laboratories have devoted much time and energy to the same end under the guidance of Mr. Roy Hunter, and this system of development has in these laboratories outgrown the experimental stage and has been put into actual practice. THE AMERICAN CINEMATOGRAPHER is grateful to these up-builders of our industry for the opportunity of being made the medium through which such improvements are brought before the cinematographers and the public in general.—Editor's Note.*]

Mr. Roy Hunter, superintendent of the Universal Laboratories, announces an extremely important and very interesting advance in motion picture production. Mr. Hunter has been for several years working upon the solution of the momentous problem of eliminating all chances of imperfection in the development of motion picture negative film.

The solution has been reached by Mr. Hunter through the adaptation of a developing machine which has been put into practical use in the Universal laboratories for over six months, during which time not less than 6,000,000 feet of negative film have been developed with a uniformity of results which cannot be surpassed and with an ease of operation which guarantees the maximum of safety in the physical handling of the valuable film.

The rack and tank system of development which has been uniformly in use in all laboratories calls for a series of manipulations of the film after exposure, each one of which presents possibilities of mishaps, some chargeable to the actual handling of the film by the operator and some to physical and chemical influences very difficult if not impossible to control.

In the rack and tank system the exposed film is put through the following series of operations: It is wound on the rack, submitted to a preliminary washing, dipped in the developing tanks, then it is rinsed, fixed, washed, transferred to the drying drum, polished and finally sent through the process of printing.

All these operations up to and including the polishing are, in the Universal Laboratory, accomplished by the machine so that the film is never actually touched by human hands from the time it leaves the manufacturer to the time it is put through the printing machine.

Let us analyze some of the most important advantages of this elimination of the human element in developing. The winding on the developing rack is subject to mishaps due to imperfect cleanliness of the rack —scratches during the guiding by hand of the film in the proper position on the rack—broken perforations while setting the film between the rack's pins—unnecessary exposure to the atmosphere from the time the film is wound on the rack to the time it is put in the developer—limitation of the length of the film that can be developed at one time. The following preliminary washing, which is at times dispensed with, should not present any particular chance of mishap if handled with care.

The developing itself by rack presents the possibility of air bells, rack flashes (almost unavoidable), nonuniformity in the flow of the developer, oxidation of the parts of the film from time to time exposed to the air for inspection, the possibility on the part of the operator of **pulling the film too short** when appearing over-exposed, or inversely of **forcing it** by a longer time of development when appearing as under-exposed. This last question is of vital importance and has been the bug-a-boo of many cinematographers and laboratory experts. Its advisability has been discussed in practical and scientific circles, and Mr. Hunter apparently gives it the practical solution. We will return to it later.

The rinsing after development should not present any uncontrollable chances of accident. The fixing may produce rack marks, and trouble due to physico-chemical effects created by the carryign of the fixing and hardening in a single solution, while the greatest possibility of serious accident, due to the physical handling of the film, lies in the transfer of the film to the drying drum, in "squeegeeing" out of it the excess of water, and the repeated handling on the drum itself called for by the shrinkage of the film during the drying process.

All of these possibilities of harm to the extremely valuable negative film have been the cause of constant apprehension to even the most conscientious laboratory operators and have caused from time to time severe losses to the producers by the necessity of retaking scenes ruined by one or more of these enumerated causes, in spite of the greatest care exercised by the laboratory operator.

Mr. Hunter's developing machine, which eliminates entirely such occurrences, is the result of some modifications brought forth into the positive film developing machines which have been in use in several laboratories for some time.

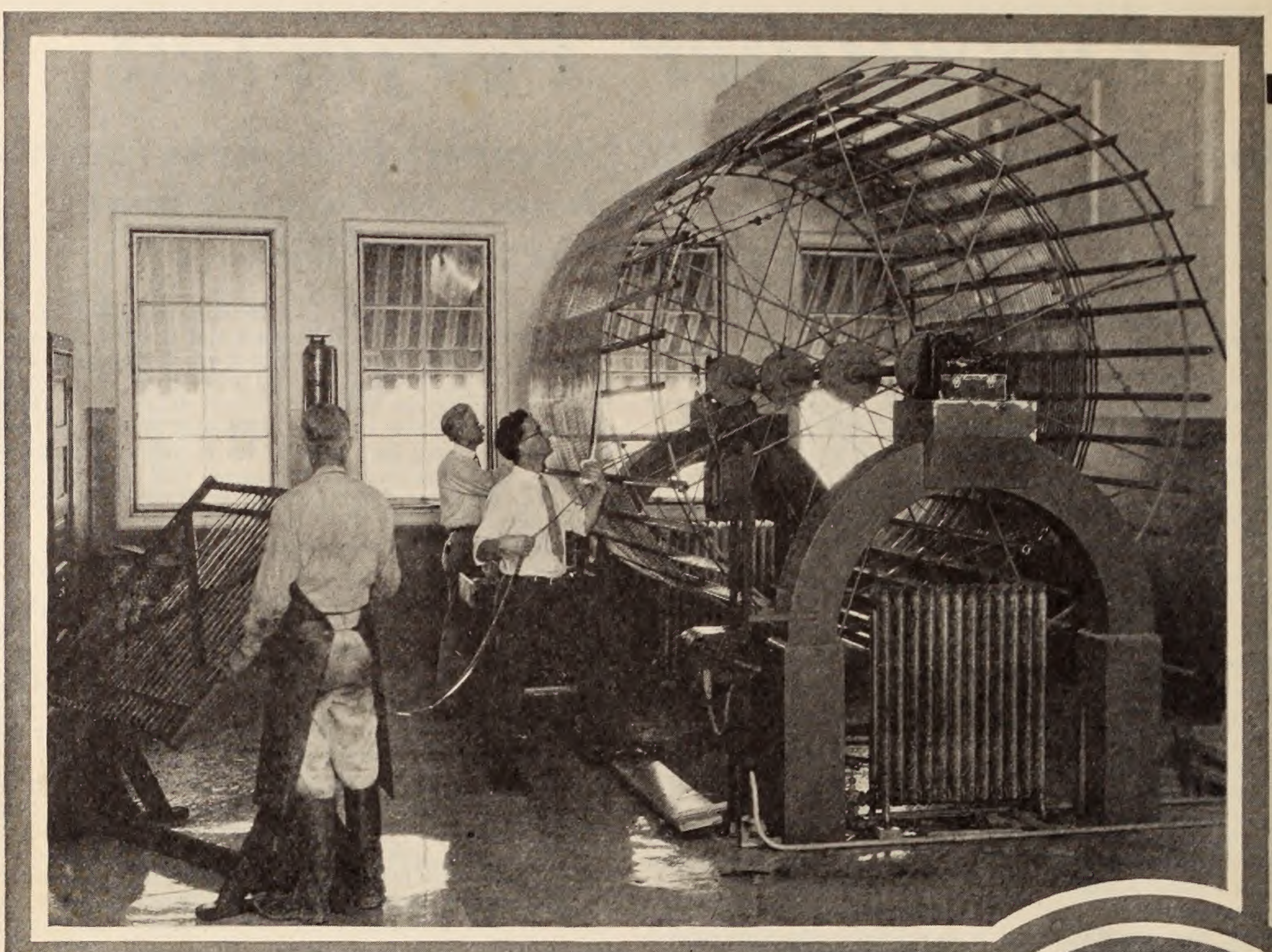
The functioning of the machine has been so studied and timed that during the twelve minutes in which the film remains in the developer, the flow of the solution is regulated so as to avoid all possibility of uneveness of development. A recording tachometer registers the speeds of the machine and the motive force is so arranged that if the driving motor should suddenly stop functioning batteries enter into immediate play and, if the batteries should fail, the operator can have immediate recourse to man power, one hand being sufficient to drive the whole machine, the tachometer giving the means of checking for a constant and regular speed.

From the developing troughs the film is sent through the rinsing process, the fixing, the hardening, the washing, which is carried in the most thorough and rational manner, the "squeegeeing" and the drying and polishing, without touch by hand, except in the rare cases in which a breakage of the film should occur, for which emergency the machine is so constructed that the broken parts of the film are within easy reach of the operator.

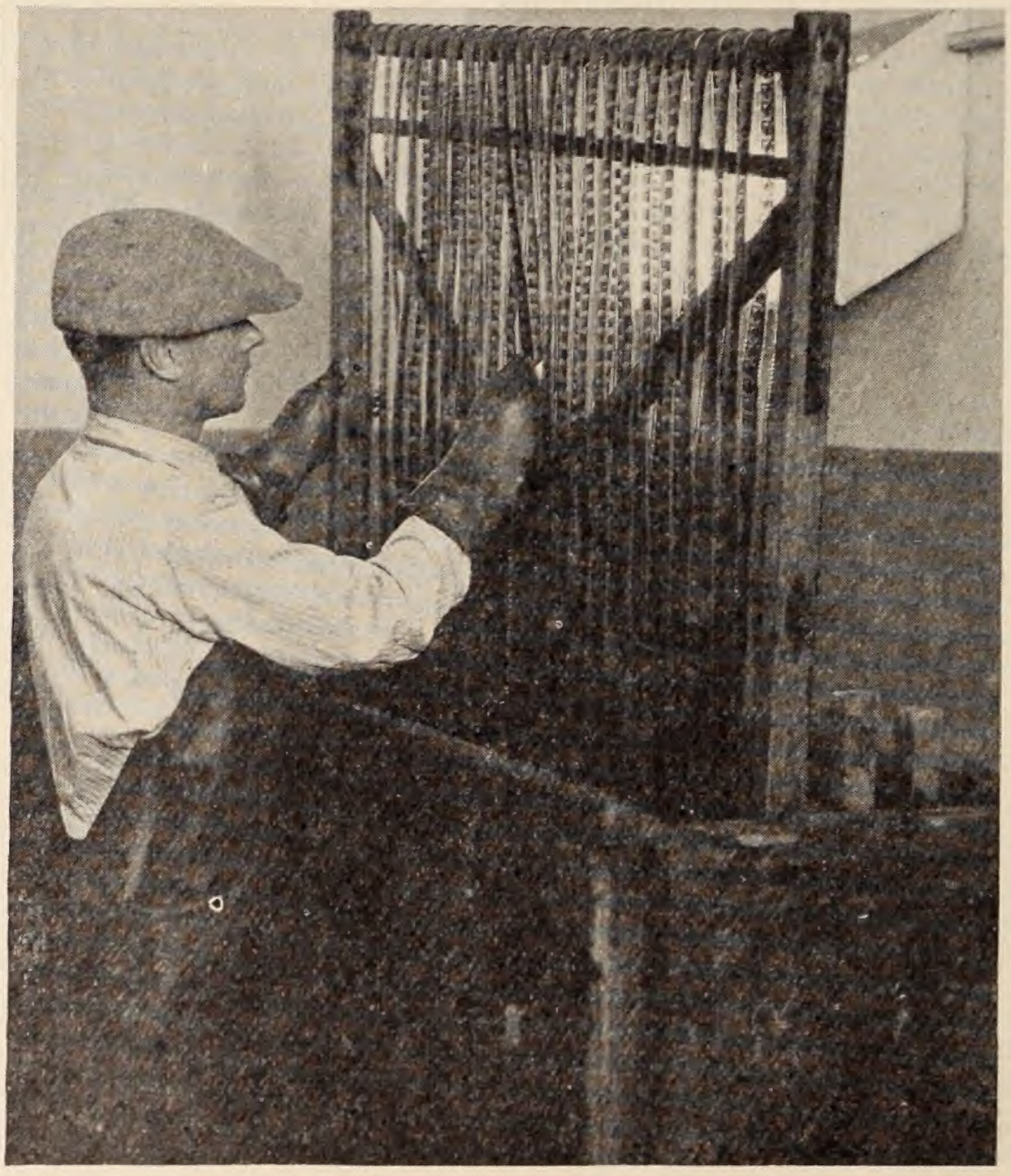
Seven seconds only are necessary for repairing any breakage, and this time of interruption in the forward march of the film is absolutely negligible when set against the twelve miuutes necessary to complete the development.

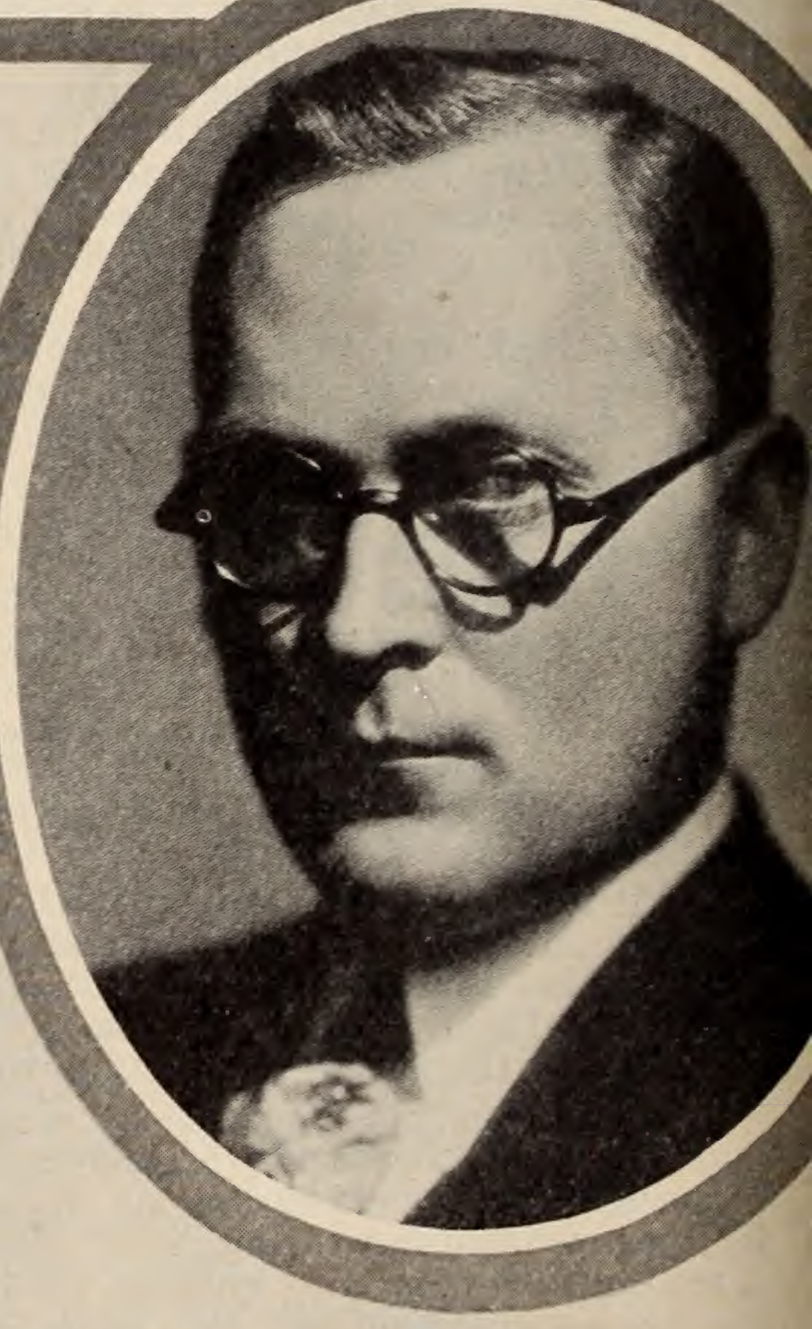
Any and all kinds of film have been developed by Mr. Hunter during a continuous run of the machine. Par and super-speed, Orthochromatic and Panchromatic films from Agfa, Eastman and DuPont have been simultaneously developed by the machine, giving a perfection of results seldom if ever obtained by the rack and tank system.

Critical tests of different subjects photographed under the greatest imaginable scale of conditions of light and exposure, have given remarkably good results and



Old Drying Drum





Old Tank and Rack method of developing


Developing end


Drying end of Negative machine
Developed, washed, dried
and polished negative coming
out ready for printing

Mr. Hunter points with pride to the quality of development attained by the Universal laboratories during the time in which the machine has been in operation, citing the forthcoming super-production, "The Man Who Laughs," photographed by Gilbert Warrenton, A. S. C., as a photographic jewel. The negatives of this production, which has required six months to make, and in which all conditions of light and lighting imaginable have been put to a severe test, have been developed through the machine with the most accurate results of evenness and quality, although these results speak very highly of Mr. Warrenton's mastery of the photographic art, they speak not less highly of the advantages of Mr. Hunter's machine and of its perfect adaptability to practical laboratory processes.

The Universal Company produces a great number of pictures, as Mr. Hunter points out, ranging from simple short subjects to the most elaborate and costly productions. No other studio entrusts to its laboratory such a diversified product, and it is interesting indeed to consider that productions representing, as stated previously 6,000,000 feet of film have been developed by Mr. Hunter's machine without a single re-take due to laboratory operations.

These remarkable results represent such a reduction of expenditure and such an element of safety that one can foresee in the near future the time when all producers and commercial laboratories will adopt the system which is the consummation of Mr. Hunter's perseverance, ingenuity and thorough knowledge of laboratory practice.

The question that arises and which is of foremost importance to the cinematographer is this: Is the time and temperature system of development as carried out by the machine to be preferred to the rack and tank hand-developing which permits the operator to constantly watch the negative and perhaps correct imperfections of exposure caused by error or by conditions of light beyond the cinematographer's control?

The answer of the writer of this article is: Although it is true that such imperfections can be partially corrected BY TRANSFERRING THE NEGATIVE IN COURSE OF DEVELOPMENT FROM ONE DEVELOPER TO ANOTHER MORE SUITABLE UNDER THE SPECIFIC CONDITION OF UNDER OR OVER-EXPOSURE, this method is never resorted to because of it being impractical in laboratories handling daily great quantities of film. BESIDES, for the same development, (and using word for word the statement of such an authority as Mr. Crabtree):

**"When the exposed emulsion is developed and thereby reduced to metallic silver for a given time of development, the quantity of silver produced is PROPORTIONAL TO THE EXPOSURE except in the case of the extreme shadows and highlights, although IN THE CASE OF MOTION PICTURE NEGATIVE FILM THIS PROPORTIONALITY EXISTS OVER A LONGER RANGE OF EXPOSURE THAN FOR ANY OTHER KNOWN PHOTOGRAPHIC MATERIAL."**

In other words, the densities of negative increase during development proportionally to the time of exposure and an under-exposed negative for instance, when overdeveloped, does not give a better or fuller negative, but a negative in which the silver deposit in the highlights is proportionally greater than in the shadows when compared with the normally developed negative. It is consequently a harder negative but not and by far, a better one.

The same proportionality, of course, stands for under-exposed negatives and a negative pulled too short from the developer will present the "mushy" appearance so well known and frankly detested by all cinematographers.

If we consider also that the laboratory operator is always ignorant of the particular subject photographed and of the effects that the cinematographer is striving to obtain the time and temperature system provided by Mr. Hunter's machine should prove a help to the cinematographer and preclude the possibility of obtaining results very far from those anticipated.

Possible variations in the developing time are checked by Mr. Hunter by testing the developer with a strip of a standard-exposed negative which is kept in the laboratories and renewed when exhausted under the most exacting precautions.

A 400-foot roll of exposed negative has been used for such tests and lasted over a period of two months. The numerous short strips were at the end of the period spliced together, the densities were carefully examined and a print made, under one single normal printing light. Variations of densities were not noticed by a number of experts called to view the film for the purpose of finding fault.

Beside the normal, every-day work of the laboratory the Hunter developing system has given a great impulse to the difficult problem of duplicating negatives.

Mr. Hunter asserts that with the use of Eastman duplicating film and his developing system, duplicate negatives of unsurpassed quality have been obtained at the Universal Laboratories, and that it is his belief that in the course of the present year the matter of duplicating negative to perfection will be an accomplished fact.

The consequence of such results are of tremendous importance in the motion picture industry, and the cinematographer awaits them with confidence and hope in the future of his art.

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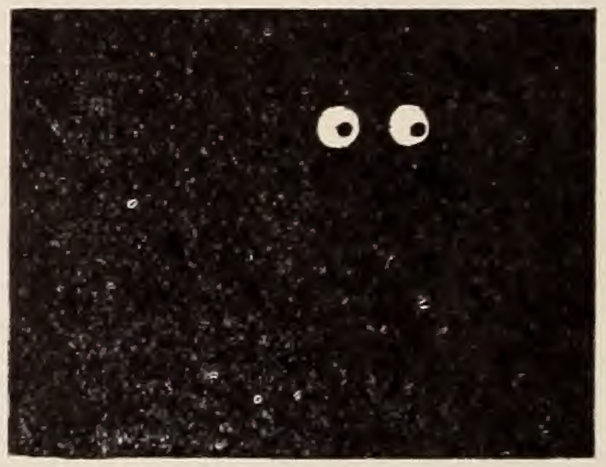
# *Why Cinematographers Leave Home*

Someone came into the studio the other day and left a tourist folder describing a certain country in the Far East. After reading this, I have come to the conclusion that the writers who specialize in jotting down flowery titles will be in line to write travel literature after a few years of hard training. A good publicity man and press agent might also stand a fair chance with these fellows by starting at the very bottom. They use approximately one gross of assorted adjectives to the paragraph, and if a small fraction of what they say is true, then I'm going up there and sprout a set of wings and settle down with the inhabitants because the place must be paradise.

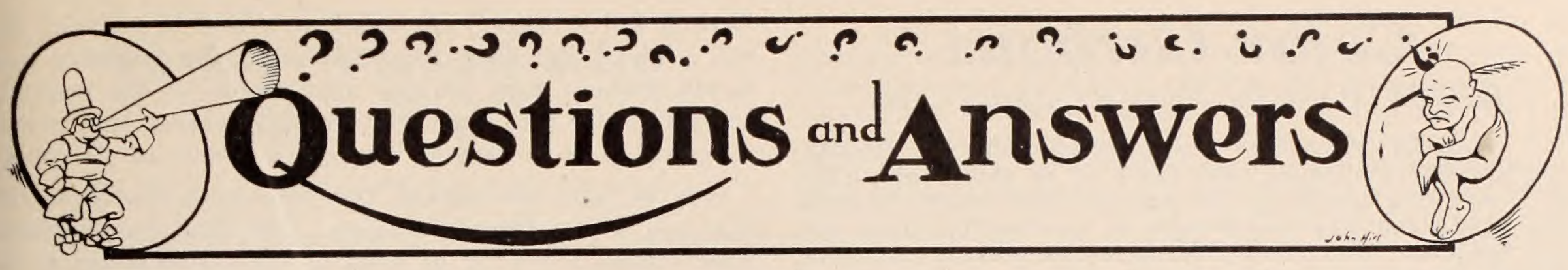


Portrait of Len H. Roos, A. S. C., loading Panchromatic negative

Not because I happened to read this folder through, and not because I have a hankering to have Christmas dinner in Singapore, and not because there are stories up in those countries that will be new to the camera, and not because it's the Tropics, the real Tropics; I say it wasn't any of these things that influenced me, but I just thought I'd like a change (a periodical affliction since I was a small boy), so I went down to the shipping company that published that folder and booked passage for Siam—via Singapore.

The folder says there are plenty of elephants in Siam; and they say that the picture theatres open to the really nice crowds about eleven o'clock at night and there are lots of parties and good food and everything going all night which will probably lead to a conversation something like this after I get settled:

"Boy! Have my Mahout park my town elephant out back of the lab. And, Boy! Tell him to turn on the tail light, I expect to be out late tonight."—From a letter to the Editor by Len Roos, A. S. C., now in Siam.




QUESTION—Does the use of Panchromatic Film require a great deal of experience?

**ANSWER—Anyone who has a fair knowledge of photography, can revert from ordinary to Panchromatic films without experiencing a great deal of trouble. We advise of course, to get thoroughly familiar with the features of Panchromatic film, before attempting its use. The time and expenditure that will be required to become an expert in the use of this film will be many times repaid by the improvement in results.**

* * *

QUESTION—Is it objectionable to use both ordinary and Panchromatic films in one picture?

**ANSWER—The uninitiated will not perhaps detect a difference between Panchromatic and Ordinary films, but the evenness of results and hte increased beauty that can be obtaind with Panchromatic film makes it advisable to use only this kind of film throughout a picture.**

* * *

QUESTION—Kindly give a list of pictures which have been photographed on Panchromatic film.

**ANSWER—Most all of recent productions are photographed on Panchromatic film. It is impossible for this department to give the required list.**

* * *

QUESTION—Is it essential to use a Filter with Panchromatic film?

**ANSWER—The sensitivity of Panchromatic film compared with ordinary emulsions is greatly increased in the yellow-to-red regions of the spectrum while its sensitiveness to the blue region remains practically unchanged. To reduce the excess of sensitivity to the blue radiations, a filter is necessary. The transmitting qualities of the different filters should be studied so as to be able to select the proper filtr for the photographing conditions. The beginner can, generally speaking, make use of a Wratten K.2 filter for long shots and of a K.1 for medium and close shots. Experience will dictate a larger selection.**

* * *

QUESTION—Is Panchromatic film faster than ordinary?

**ANSWER—No; Panchromatic film is not faster than par speed film but through its increased sensitivity to the yellow and red radiations, it permits sufficient exposure in many cases where par speed film would fail to give satisfaction. During the late hours of the day, for instance, when the sunlight becomes rich in warm tones, Panchromatic film will give results unattainable with par speed emulsions.**

* * *

QUESTION—What different degrees of shutter aperture are used for various subjects of different speeds such as emotional drama, slap-stick comedy, interiors and exteriors, etc., do professional cinematographers use?

**ANSWER—The various degrees of shutter aperture are used almost exclusively to regulate the exposures indpendently to the speed or "tempo" of the picture. In som particular cases such as while cinematograping an exceedingly rapidly moving object, or revolving wheels of a piece of machinery the regulating of the shutter is done so as to "stop" the moving object as much as possible in each frame-picture in the first case, and so as to synchronize the movement of the rotating wheels with the rotation of the shutter tiself, in the second case.**

* * *

QUESTION—What salary are the cinematographers now-a-days getting?

**ANSWER—These are trade-secrets—not to be given to the press. Nevertheless we may tell you that the cinematographer's salary is based upon his artistic and scientific achievements.**

* * *

QUESTION—What is the usual life of a Positive print? Is it the same as a negative?

**ANSWER—The life of a Positive print is dependent upon the care with which it is handled during projection. The unaboidable wear to which it is submitted is of course superior to the wear to which the negative film is going through in the process of printing. Care in the projecting of the positive and in storing it following the instructions given by the manufacturer, is responsible for the keeping qualities of the film.**

* * *

QUESTION—In titling a picture is it best to use a past or present tense?

**ANSWER—As a general rule, an audience, if interested in the picture will "live with it." The title is complementary to the action that the subject is performing right at the time that your audience is looking at it on the screen, therefore the present tense is generally the most adaptable to titling.**

* * *

QUESTION—How can I obtain cloud effects in my films?

**ANSWER—By the use of panchromatic film and suitable filters, you can so reduce the excess of light that is given forth by the sky, and register every little cloud even if it is almost invisible to the eye.**

* * *

QUESTION—How much more exposure shall be given when using light filters?

**ANSWER—Filter manufacturers give an exposure factor for each filter. These factors are quite reliable for all practical purposes and intents.**

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## Some Psychological Aspects of Natural Color Motion Pictures

### *By* L. T. Troland

(Extract from S. M. P. E. Paper)

It has been the belief of many persons that natural color introduced into motion pictures is not required by the public and more than this that color actually detracts from the dramatic effect. It is argued that a story can be told well in cold print, and that attempts at anything more than a mild coloration of pictures have been up to the present only in the nature of a novelty.

In refuting these arguments it is asked: "How can the existence of the stage or the motion picture continue if cold print is adequate in building up in our minds a complete picturization?" The answer is that natural sounds, natural coloration and increased reality due to any other characteristic are necessary to produce the most enjoyable result. The overdrawn sounds and colors of the stage and the profusion of color that appeals to us from every package label and billboard certainly have a strong appeal.

A new process of color photography now makes possible a really truthful representation of colors, especially those which we know best such as those of flesh and foliage. In the near future increased reality, due to natural sound and natural coloration will add to the already great attractiveness of the motion picture.

# *Color Carbons*

*By* C. W. HANDLEY, *National Carbon Co., Inc.*

With the advent of Panchromatic film the cinematographer is becoming even more of an artist than ever. It is not only necessary for him to know where to place the lights and how much light to use but he must also use lights of various color values to get proper rendition. Panchromatic film unlike regular film is sensitive to all colors of the spectrum in varying degrees and he must know what the color value of his illumination is as well as the reflective value of the sets. In likening the cinematographer who paints with light to the artist who paints with pigment we cannot tell him how much paint he should use or where he should apply it, as that is a characteristic of his artistic ability, but we can furnish him with valuable information as to the mixing of paints and the proper use of the brushes.

For further discussion, let us divide light into four factors—Quantity and Quality, Direct and Diffused. For our purpose, Quantity is that factor which determines the key in which the picture is produced, that is, if it is produced in low key a smaller quantity of light is used and when the figures leave the foreground they become silhouettes. High key then is the opposite. Quality is that factor which determines the true color rendition of the objects photographed in their proper shade of gray, from white to black.

Direct light is characterized by the high-intensity arc where we have an enormous amount of light coming from a small source—Approximately 5/8 of an inch in diameter.

Diffused light is obtained by scattering the rays in all directions.

In producing an image on motion picture negative there are three vital factors, namely: The sensitivity of the film to various colors of light; the quality of the illumination and the reflective value of the objects photographed. For example, let us photograph a card painted with various color bands, using regular film and white flame carbons. We will start with the card. The red band is not actually red; it only appears so because of the pigment in the paint which has the characteristic of absorbing all of the other colors in the illumination and reflecting red. To prove this to yourself, hold any red article under a mercury tube, and you will see there is no semblance of red in it. That is because there is no red in the radiation of a mercury tube.

When you look at an article to be photographed, do not think of it as being of a certain color, but think of it as being a mirror that will only reflect the one color and will absorb all others, then you can readily understand why it is necessary to have all the colors in the illumination to give true value.

What happens when we start the camera to photograph this sign? We have a film that is only sensitive to blue and violet, and we have a large amount of blue in the illuminating light. Let us take the blue band. The Blue Band reflects blue through the camera lens and makes an impression on the negative (which is sensitive to blue) and the higher its reflective value the more blue it reflects and the darker it makes the negative and naturally the lighter that makes the positive, so that light blue which has a higher reflective value than dark blue appears almost white.

However, when we take the red band, this same condition does not exist because the film is not sensitive to red and little or no impression is made on the negative which makes the positive dark.

This lack of sensitivity in the film gives us distortion because blue which is ordinarily a darker color to the eye than red photographs lighter. This makse it necessary to use heavy grease paint which covers up the natural color—otherwise if the person photographed flushed (as in anger), it would not tend to register the red part of the face as strongly on the negative and would make a dark blotchy appearance on the positive. Panchromatic film was produced to correct this condition, and it is in varying degrees sensitive to all colors.

Let us now photograph the card with Panchromatic film and White Flame Lighting: The Blue Band reflects blue—there is plenty of blue in the illumination to be reflected and the film is sensitive to blue, therefore for that color, conditions are ideal—however, when it comes to the yellow, orange and red bands it is not so good, because while we have the proper reflector and a film that is sensitive to all colors, our lighting is overbalanced in the blue so that our blue band gets more than its share of color and therefore makes more of an impression on the negative than it should in relation to the other colors, and while there is not the distorted condition that we have with regular film and white flame carbons, we still do not have satisfactory color rendering.

If white flame carbons did not have some of the yellow, red and orange in them however, our conditions would be exactly the same as with regular film—in other words, if we should use Panchromatic film with a light 100% blue and violet, we would be bringing Panchromatic film back to regular stock by means of illumination.

To make this necessary "color painting" possible, there has been produced a series of carbons that will give any range of color balance desired. With the advent of these new carbons, it is now possible with the present arc lamp equipment to obtain a light which is highly desirable for use with Panchromatic film by merely inserting them in the place of those now used with Orthochromatic film. The White Flame Carbons were designed to meet the requirements of Orthochromatic film and are particularly rich in the shorter wave lengths of light, i. e., blue, violet and near ultra-violet.

The Orange Flame Carbons were designed to meet the requirements of Panchromatic film, that is they produce a light rich in red and green as well as the blue and violet. In addition to meeting this requirement they produce a very pleasing light which is easy to work under, as is the case of the white flame arc, the orange flame carbon produces several times as much light per unit of energy consumed as any other illuminant known.

It is estimated that there is between two and three millions of dollars invested in arc lamp equipment in the motion picture studios. Were it not possible to produce carbons for use with this equipment, it would necessarily have to be scrapped. Fortunately, however, the carbon arc may be called a versatile light source, in that it is capable of being adapted to many various conditions. Certain elements can be introduced in the cores of carbons which increase the light in the short ultra-violet wave lengths. Other elements in the blue and violet, still others in the red and green. In other words, by introducing certain elements in the cores it is possible to incease the light in certain bands. It became therefore a problem of merely changing the ingredients of the carbon to meet the changed conditions.

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Mr. George A. Blair, Sales Manager Motion Picture Division, Eastman Kodak Company, Rochester, N. Y., will be at the Hollywood headquarters, 6700 Santa Monica Boulevard, during the month of February, arriving here February 1st.

# "Color Vision and the Eye"

*By* FRED MCBAN, *Physicist, Creco, Inc.*

The normal human eye is made up of a spherical chamber with a circular opening by a system of lenses contained therein and controlled by the brain. Light enters the opening of the eye, forming an impression, or image, on the back of the chamber, identically in the same manner as does a photographer's camera.

When we analyze sections of the eye, we find that it is surrounded by a filmy material called the "Sclerotic." A portion of this filmy substance is transparent and is known as the "Cornea." The crystalline lens is attached to the walls of the eye by the ciliary muscle. In front of this lens is the diaphragm, usually called the "Iris." The color of the iris is referred to as the color of the eye.

In the center of the diaphragm is a circular orifice known as the "Pupil," behind which is the crystalline or lens. When the eye is at rest or in the normal position it is so adjusted that the image of any distant object is focused by the lens on the "Retina." If, when brought to focus on a nearer object, it must be altered; this is done by a forward motion of the lens with an increase in the curvature of both its surfaces.

When the eye is adjusted for ordinary light conditions, that is light containing all its known wave lengths, being white to the eye, the focus of the violet, or short waves, comes nearer to the eye lens than those of the red, or longer waves.

This difference of focus can be clearly proved by looking through a piece of cobalt blue glass, the familiar blue glass that is used in getting the true photographic renderings of motion picture sets to be photographed on orthochromatic film stock. For an example test, if we look through a piece of this same glass at an ordinary electric incandescent lamp, such as used in the home and studios, we see two images of the filament superimposed; a blue-violet one and a red one. Should the lamp and the filament be at a considerable distance, for instance, twenty or thirty feet, the eye will involuntarily focus on the red image, which consequently appears surrounded by a blue-velvet light. Should the filament of the light be so near that the eye cannot focus on the red, the blue-violet image will be seen to be surrounded by a red haze of light.

By actual tests we know that the eye functions best when the character and settings are viewed with the aid of a white light.

Indications are that for low intensities, or low key lighting, sensibility occurs mostly in the green end of the spectrum, that for the more intense lights toward the red end of the same, this combination would seem to make conditions ideal for cinematography, but until we have the right kind of film stock, we are at the saturation point of results.

When we consider visual acuity and that alone, monochromatic light has a slight advantage in that it gives more detail than light with an extended spectrum, but the reason against its use is the one of unnatural line and false reflective values.



## Economy Seen *in* Good Equipment

By Daniel B. Clark
PRESIDENT
American Society of Cinematographers

### Dilapidated Outfits Prove Burden *to* All Concerned, Including Audiences

Being connected with the Tom Mix company at the Fox Studios takes the writer to every section of the West for location scenes in the productions we make. Most of these location trips send us to sparsely settled sections. If we are not camping out or roughing it, we find our headquarters in some small Western town where the chief attraction problably is a motion picture theatre. (We have learned that we never get so far in the back-woods as to be out of the territory of a film house.)

Because I am interested in the subject of projection, I invariably take the first opportunity to make friends with the projectionists at such houses. I find that we have much in common, the projectionist being just as interested in my line of work as I am in his. It is always a matter of interest for me to observe his equipment in the projection room, just as he usually likes to look over our camera paraphernalia. Now to get to the point of this article:

In many of these houses, I have found up-to-date equipment. In others, I am sorry to say, I have found projection facilities sadly neglected. Very often, in the more modest establishments, the owner or manager presides over his own projectors—and has done so for many years past. It goes without saying that he is not an expert on the maintenance of his equipment, no matter how simple or fool-proof it may be. He gets a passable picture on the screen, and that is all.

In still other instances, the same type of equipment prevails in houses where there are projectionists. The possibilities are that the projectors, new or second-hand, started out in the custody of the exhibitor, who, on becoming more prosperous, turned his projection room over to a projectionist. The latter, no doubt inherited a run-down lot of instruments. It required and continues to require all his ingenuity to keep them anywhere near their original and just stage of efficiency. He no doubt is obliged to put in much of his time—and that of his employer—in keeping his apparatus in running order.

I can't see where the exhibitor can cling to the idea of economy in maintaining a worn-out system of projection. Repairs, working time, and faulty screenings more than offset any possible savings. Out of respect to every one concerned, it is my belief that in many of such houses, the best thing to do is to install a completely new array of projection apparatus. The investment involved—and it is an investment—would be more than rewarded in the elimination of repair bills, better screening, etc. Then don't let us lose sight of the effect that such equipment will have on the projectionist. I don't hesitate to say that up-to-date equipment proves a tonic to his morale. I feel that, in this respect, he is like the cinematographer, who, I am sure, enjoys the urge of having a highly efficient and modern camera outfit to serve him and, in turn, to have cared for—and not a ramshackle bunch of moving parts that might function, and might not.

Now I don't think that such conditions are fair to the projectionist. Nor are they fair to the audiences. Nor are they fair to the exhibitor himself. If you were running a taxi system, you wouldn't expect to get by with an antiquated fleet of cars. It stands to reason that no matter how conscientious the projectionist may be with the equipment, which has suffered from ill treatment in the past, he cannot screen as good an exhibition as he would be able to if he had modern and up-to-date equipment.

# *A Mazda Marathon*

For the information of those outside of the A. S. C. who may be interested in incandescent lighting in the production of motion pictures it is announced that the A. S. C., in co-operation with the Academy of Motion Picture Arts and Sciences and Warner Brothers Studios, began on the night of January 16, a sixty day demonstration the conditions of which are set forth in a general letter sent to the entire membership of the A. S. C.

For the place of demonstration the A. S. C. is indebted to Warner Brothers Studio who have provided a suitable set with full equipment of both incandescent and arc lights and have installed seats for observers. Actual operations in the studio are under the direction of Mr. Fred Gage, laboratory superintendent, and Mr. Frank Murphy, electrical engineer.

Subjects also are provided through the Warner Studio, while raw stock is generously supplied by the Agfa, Dupont and Eastman Western representatives.

The last word in incandescent lighting equipment is supplied by Mole-Richardson.

All tests are made by first cinematographers and the set is at the disposal of the demonstrators between 9 A. M. and 5 P. M. in periods of two hours each. Night demonstrations may be arranged for when desired.

Regular meetings of the A. S. C. will be held on the set on Wednesday and Friday nights throughout the sixty days period of demonstration. On these nights representative cinematographers will be chosen to have charge of the tests.

Arrangements for time and use of set and equipment must be made at headquarters of the A. S. C. in the Guaranty Building, Hollywood.

Negative may be developed by any laboratory, at the choice of the cinematographer making the test.

A complete record of every test and demonstration will be kept in technical detail and will become a part of the records of the A. S. C. for the benefit of the industry in general.

All members of the A. S. C. are urged to seize this opportunity to obtain a liberal education in lighting.

In this connection Mr. Frederick Beetson, Executive Vice-President of the Association of Motion Picture Producers, has become so impressed with the importance of this sixty day demonstration that he sent out the following letter to representative officials in all departments of the industry. THE AMERICAN CINEMATOGRAPHER hereby acknowledges the courtesy of Mr. Beetson in permitting its publication:

January 19, 1928.

Last night I attended a major demonstration of Mazda lighting equipment with actual shots made on Eastman, Agfa and DuPont stock followed by the same sets being shot on the same stock with hard lighting.

There were present last night one hundred and twelve cameramen seriously studying the effects in order to make themselves of greater value to the industry.

These demonstrations will continue two and three nights a week for the next five or six weeks. The expenses are being met by this Association through the Academy of Motion Picture Arts and Sciences.

The stage space is free, the juice is free, developing and printing free—most of this through the very generous courtesy of Warner Brothers and particularly through Mr. Koenig and Mr. Murphy of that company. The cameramen are devoting their time free and the various film companies are furnishing the stock free, the only cost being for electricians day and night and a few extras to dress the sets.

It behooves everyone in this industry to attend some of these demonstrations and I urge that all of those interested in this particular line of work, from the chief executive down the line, attend some of the demonstrations. I assure you it will be a revelation to you.

Very truly yours,

FRED W. BEETSON,
Executive Vice-President.

# *Movie Make-Up*

*By* Louis W. Physioc

*(Continued from Page 6)*

larly true with motion pictures, due, probably, to the great expense of production. We have lapsed into a state of ultra conservatism as regards things new. We wish, always, to "place the safe bets." However, the photographic department has begun to loosen these fetters of conservatism, somewhat, by the adoption of panchromatic film, but we are yet a little uneasy about the make-up in connection with the use of this new stock. We, therefore, suggest a modification of make-up, for reasons that we may classify in detail.

1st. The panchromatic film, now being widely used, is sensitive to a wide range of colors, compared to the ordinary film, and for this reason the make-up may assume the more natural flesh tints, except that the rouge on the cheeks may be ignored. There is one difficulty, however, with the natural make-up, which is found to be due to the difference between the exterior and interior light. In such cases, a touch of neutral gray will not altogether destroy the natural color and will aid in matching face values under the different lights.

2nd. Modeling is very often the result of delicate coloring, both in the lights and shades, therefore, no exaggeration of make-up, such as shading eye sockets, etc., should be practiced, except, purely, for character work. Flatness is often greatly relieved, even under highly diffused light, by the power of panchromatic film to render delicate values represented in tints rather than tones. Great freedom in chiaroscuro lighting can be employed, with the more natural make-up, plus the pan stock, without much danger of harshness to the photographs or disfavor to the artists.

3rd. Imperfections in the texture of the skin are exaggerated in photography for various reasons. Lights and cast-shadows are cooler (that is they tend towards the blue end of the spectrum) than the local color and shades, and these values are rendered more extreme by the photographic process. The cooler tones of the lights develop up, in the negative, in greater proportion than the warmer tones of the shades, which accounts for the unpleasant, blotchy appearance of pictures from unretouched negatives. The panchromatic film reduces this fault by virtue of its color sensitivity.

4th. Because of those facts, cited in No. 3, the make-up should be considered, not so much from the standpoint of color as for the purpose of filling up excrescences, character lines or signs of maturity. This should not be overlooked, even in the enthusiasm for Panchromatic film.

5th. Characters and types should require no make-up, with panchromatic film, their value lies in giving to the camera all they have.

6th. Although some cameramen are very enthusiastic as to powers of panchromatic film, we suggest caution among the stars and principals in relinquishing make-up entirely. We cannot yet retouch the motion negative, and their beauty is of paramount importance to their public. Their chief care should be to endeavor not to present too great a contrast to those, near them, without make-up.

7th. There is, yet, a great difference between exterior and interior lighting, even with the tungsten incandescents, and it is very difficult to make the colors of make-up, costumes, etc., appear the same under these two conditions. The aesculin and aero filters match exteriors very well with the tungsten light of the studios, but photographers working with the arcs should recommend a more neutral make-up, because the arc, without the modification of filters, will render the more natural flesh tints muddy and coarse. Reds are extremely difficult to match on exteriors and interiors under these conditions.

8th. When working against a sky which is being held down for a night effect, an entirely different make-up is necessary. The effect depends upon a high degree of correction with a deep red or gamma filter, which neutralizes all of ruddy tints of the flesh and makes the face appear a ghastly white, and although it may sound unpleasant, a greenish-gray make-up would be more suitable.

9th. Some earnest actors welcome the abolishment of make-up, because they are allowed the freedom of touching their faces, or mopping their eyes—instead of their noses, in crying scenes, and gives free play to facial expressions without fear of spoiling the make-up. However, there are others who say that they feel lost and uncomfortable, and even naked and indecent without their grease paint.

In conclusion, we feel constrained to call attention to certain facts that may be of assistance to actors and cameramen, alike. There is a wide diversity of opinion, among the cameramen, as to the treatment of panchromatic film which must, of necessity, have a great influence on make-up. Some are using this stock entirely without filters; some using the filters on exteriors; others using filters on both exteriors and interiors; some working under the arcs and those now adopting the tungstens. This great variety of treatment must often mean an unbalanced effect of faces on the screen. It is, therefore, highly important to work for a uniform system of treatment, without too far submerging the individuality of the cinematographer. Otherwise, it would entail considerable trouble and study on the part of the actors in modifying their make-up to keep up with the great range of panchromatic film. It must not be overlooked, however, that the greater the range of any medium we are working in, the greater the opportunities of individual artistry.

# *In the Stone Age*

*By* PERRY EVANS, A. S. C.

This one dates back to the STONE AGE of moving pictures when directors were temperamental and cameras looked like a kitchen stove. In the incident I am about to relate, friend cameraman was equally temperamental, in fact so much so that he refused to mingle with the commonplace actors at luncheon, but brought his own and ate in solitary majesty.

In those days if a director had more than three people on the set he became very nervous, in fact every one connected with the troupe felt the strain of a terrific overhead. In this case we were using a troupe of cavalry for the day and, having finished my own production I was sent out to shoot an extra camera with the Temperamental Troupe. Considering the big occasion of course every one was very nervous.

After setting up our cameras the director went through what I learned later to be his customary routine by howling at the top of his voice: READY! ACTION! CAMERA! GO! We started cranking and over the hill came the cavalry. Glancing over at friend cinematog-

Left to right—Perry Evans, A. S. C., cameraman; Monte Blue, star; Joseph Brotherton, director.

rapher, I noticed him bearing down heavy on his crank, each turn becoming slower and slower until finally he came to a stop. Then he ran out in front of my camera howling and waving his hands in a frantic effort to bring the oncoming cavalry to a halt.

By this time our temperamental director went into his animal act by first throwing his scenario on the ground, then his hat, then his coat, all in one pile, then he got on top of it all, tramping it down, howling and crying like a Comanche Indian and ending up by falling over in a faint.

Here the temperamental cinematographer picked up the action by kicking his tripod legs and calling his camera everything he could think of, saying it never was any good and never would be.

By this time the troupe of cavalry had gathered around close to find out who was at fault. Also our director came to just in time to see the cameraman open up his camera and after one glance at the inside of the box he went into the second episode of his animal act and passed out again.

Characteristic of a camera buckle, there in plain view were yards of mangled film, knotted, twisted and packed tight, and last but not least were those two delicious club-house sandwiches all ground up in the sprockets.

# *Lubrication of M. P. Film*

*By* J. I. CRABTREE *and* C. E. IVES

*(Continued from Page 10)*

Carnauba 5% .....125%
Johnson's floor wax 6% .....185%
Beeswax .....260%
Paraffin 1% (M. P. 130°-140°F).....310%
Paraffin 2 parts
Carnauba 1 part
2% .....380%
Paraffin 2 parts
Carnauba 1 part
5% .....480%
Paraffin 5% .....850%
Eastman edge waxed film .....950%

The above results indicate that certain waxes such as montan can produce a negative lubricating effect and that the lubrication produced by all the waxes increases with the quantity applied.

Of the waxes tested, paraffin wax was the best lubricant and at a concentration of 5% was as satisfactory as Eastman edge waxing. However, a coating of pure paraffin wax was relatively soft and tended to show finger marks. Experiments were therefore made with a mixture of a hard wax (carnauba) and paraffin wax in the proportion of two parts of paraffin and one part carnauba. Such a mixture gave a harder coating with a high gloss but the projection life was about 40% less than that of plain paraffin. However, in practice the projection life of film is usually determined by factors other than the point at which the perforations break down. Film is frequently rejected on account of bad scratches before this point is reached and it is therefore considered that the projection life of film treated with the carnauba-paraffin mixture is satisfactory.

**2. The Tendency of Surface Waxed Flm to Deposit an Excess of Wax in the Projector Gate.**

As mentioned previously, in the case of edge waxed film, there is a tendency for an excess of wax to accumulate in the gate so that on threading a warm projector and allowing to cool, the wax cements the film to the gate so that it will not pass down through the gate on starting the machine.

Tests were accordingly made with film surface waxed with a 5% solution of a mixture of two parts carnauba wax and one part paraffin wax. Twelve one thousand foot reels were projected in succession through a simplex projector without disturbing the gate. At the completion of the run, a piece of unwaxed film was threaded in the machine and the machine allowed to stand for one hour so as to be cool thoroughly. On starting the cooled machine, the film pulled down satisfactorily through the gate showing that no serious quantity of wax had accumulated as a result of the projection of the twelve reels. Examination of the gate showed the presence of negligible traces of wax but there was present a slight amount of "fluff" which was presumably deposited on the film from the buffing wheels.

In this connection the heated reels after projection were allowed to cool thoroughly and then rewound. No tendency for the convolutions to stick together was observed and the possibility of this happening is somewhat remote because the surface coating of wax applied to the film is extremely thin.

**3. Effect of Surface Waxing on the Propensity of Film to Show Oil Spots to Projection.**

It is well known that when film accumulates oil in the projector, hte effect of the oil is usually visible on the screen as patches of lesser density than the surrounding portion which is free from oil. The effect of clean oil is to fill up the tiny surface craters thus reducing light scatter which results in an increased transparency of the film. In the case of dirty oil, or when

dirt is applied to clean film treated with clean oil, the oil spotting is greatly exaggerated and such dirty oil produces dark spots.

A study of the surface structure of motion picture film (see Fig. 2) explains why it is difficult to remove oil by mere wiping. The oil sinks into the innumerable craters present on the surface and can only be removed by treatment with suitable solvents.

At the outset it was considered that a waxing treatment might insulate the gelatin surface from the oil and reduce the propensity for oil spots to show on the screen. This was tested as follows:

Film toned with an unraium toner was used for the test because such toned film has a maximum propensity to show oil spots, presumably because of the extremely pittel nature of the film surface. A reel of film was assembled consisting of fifty foot strips treated as follows:

| Sample | Nature of Film |
|---|---|
| No. 1 | Plain unarium tone. |
| No. 2 | Waxed with 5% paraffin in carbon tetrachloride. |
| No. 3 | Waxed with 5% solution of 2 parts paraffin and 1 part carnauba. |
| No. 4 | Waxed with 1% carnauba and overcoated with 5% paraffin. |
| No. 5 | Waxed with 1.5% candelilla and overcoated with 5% paraffin. |

Preliminary tests to determine the rate of solution of cold waxes and mineral oil indicated that carnauba and candelilla waxes were more impermeable to oil than paraffin, so that in the above double coated tests the object of the first coating of carnauba or candelilla wax was to protect the film against oil, while the coating of paraffin was to secure maximum lubrication.

A good grade of light machine oil was splashed in liberal quantities on all the samples while the film was being wound from one reel to another. The film roll was then rewound twice during which time the oil was smeared over the surface with a cloth. After this treatment the film surface presented a mottled appearance. The reel was then projected immediately and subsequently three times each day.

After the first day objectionable oil spots appeared on the unwaxed sample. At the end of one week no oil spots were visible on any of the waxed samples. It was concluded therefore that paraffin wax although miscible with oil, prevents oil spots. In order to prevent oil spots it is apparently merely necessary to fill up the crater-like depressions on the surface of the film.

A roll of toned film treated with candelilla wax and then splashed with oil was prepared over a year ago and projected at frequent intervals up to the present time. No oil spots have appeared on this film to date.

**4. The Tendency of Surface Waxed Film to Accumulate Dirst and Develop Scratches on Projection.**

Sufficient data have not yet been secured to determine the effect of the surface coating on the propensity of the film to accumulate dirt and develop scratches on projection in comparison with untreated film. A projection test was made by applying dirt to the projector gate and by throwing the film on a dirty floor and then projecting. No appreciable difference in the quantity of scratches or dirt accumulated on the film was noticed between surface waxed and edge waxed film.

Data in this connection are being secured by circulating reels, half of which are surface waxed and one-half edge waxed, through various exchanges.

**5. The Tendency of Surface Waxed Film to Retain Mositure.**

It is well known that if the gelatin coating of motion picture film is deprived of its moisture content, the film tends to become brittle. The chief cause of brittleness of projected film is the loss of moisture as a result of repeated baking of the film in the hot projector gate.

It was considered that possibly the surface coating of wax might retard the evaporation of moisture from the gelatin and this was tested by first humidifying a strip of film for one hour in an atmosphere at 90% relative humidity, surface coating one-half of the strip with wax and then placing the waxed and unwaxed strips in a desiccator over night. No difference in brittleness of the two dried out film samples was noticed. Apparently the wax coating on the film surface is so thin that it does not appreciably retard the rate of evaporation of mositure from the film.

### Summary and Practical Recommendations

The projection life of motion picture film can be prolonged considerably by coating either the edges in the region of the perforations or the entire gelatin surface of the film with a thin film of wax. Edge waxing as now practiced by use of the Eastman edge waxing machine is an efficient means of lubrication providing it is done correctly, but if the molten wax is not heated sufficiently during application, there is a tendency to apply too much wax to the film. This causes an excess of wax to accumulate in the projector gate so that if the freshly waxed film is threaded in a warm projector which is then allowed to cool, the wax solidifies and holds the film so tightly that on starting the projector the film remains sationary in the gate and, in the case of most projectors, then catches fire.

An excess of wax on the film also causes the convolutions of the film to adhere together when the film roll cools after projection, and particles of wax torn from the film on rewinding tend to settle on the picture area causing spots and unevenness on the scheen. Edge waxing is also impossible in the case of film with an edge sound record.

By coating the entire surface of the film with an extremely thin coating of a suitable wax, or mixture of waxes, and then buffing or polishing, many objections to edge waxing are overcome. This may be done efficiently by applying a 2% solution of a mixture of carnauba wax and paraffin wax dissolved in carbon tetrachloride, by means of a suitable machine which buffs the film surface to a high gloss after application of the wax. The exact proportion of carnauba and paraffin waxes is a matter of choice. A high proportion of carnauba gives a hard, highly polished coating while a high proportion of paraffin gives a softer coating with less gloss but with a greater lubricating value. The following formula containing equal parts of carnauba and paraffin gives a sufficiently hard coating with satisfactory lubricating qualities.

| | Meteric | Avoir. |
|---|---|---|
| Carbauba wax (M. P. 175°-185°F) | 10 grams | 150 grains |
| Hard paraffin wax (M. P. 130°-140°F) | 10 grams | 150 grains |
| Carbon tetrachloride to | 1000 cc. | 32 oz. |

With this method of application it is practically impossible to apply a dangerous excess of wax to the film so that the above difficulties caused by the application of an excess of wax are eliminated.

A film surface waxed in the above manner has also a minimum propensity to show oil spots on projection even when a liberal quantity of machine oil is applied to the film in the projector.

Practical tests have shown that the projection life of surface waxed and buffed film, as determined by the point of complete breakdown of the perforations, is not quite as great as that of edge waxed film. However, in practice film is rejected usually for other reasons before the complete breakdown of the perforations, so that the projection life of surface waxed film is considered satisfactory.

### Acknowledgement

The authors are indebted to P. J. Closser and L. F. Muehler who assisted in the experimental work and to R. N. Titus who made the photomicrographs.
September 16, 1927.
Rochester, N. Y.

# *Len's Terrible Dream*

*By* LEN ROOS, A. S. C.

The other night I had a dream. It seemed that Claude Carter, A. S. C., came up to me on the street:

"Big story breaking in Heaven this afternoon, Len," he ses.

"Yeah?" I asks.

"Yeah," ses Claude, "and I think I'll run up there and cover it."

"Shoot a piece for me, too," I ses.

"Righto," ses Claude ("Righto" is the Australian equivalent for "You're Faded").

So he grabbed a camera and beat it up the stairs, and when he got to the top he rang the bell at the gate and St. Peter answered the ring and asked what he wanted. Claude told him that he had heard there was a big story breaking and he wanted to make a picture of it.

St. Peter says: "I'm horribly sorry and all that sort of thing, old chap, but you see we have had a rule up here since time immemorial that no cinematographers are to be allowed in Heaven."

"Well," ses Claude, "I never have any trouble getting in other places to make pictures, and besides it's a beautiful day for pictures. What's the story, anyway," ses Claude.

"We are unpacking a new shipment of harps," says St. Peter.

"Bonza" (Australian for "Great"), ses Claude. "Can you imagine what they'll do titling that? 'Largest shipment of harps in history arrives in Heaven,' 'Crowd awaits spell-bound as new instruments are unpacked.' We could make a longshot of the shipment arriving and then show a closeup of a case and then cut to the crowd and then show closeups in the crowd of people straining to see and then show a case being opened and the harps being unpacked, and then giving the biggest one to some prominent person and then fade out on a group all playing and somebody doing the Charlesburg or something. It would make a great picture," says Claude.

"I don't doubt that," says St. Peter, "but I am not in a position to break this rule."

"That means that I can't get in," ses Claude.

"I'm sorry, but I'm afraid it does," says St. Peter.

"Fudge," says Claude, and came back down the stairs with his camera. I met him as he left the golden stairway and asked how he got on.

"No good," ses Claude, "they won't allow cinematographers in Heaven."

"Do you mean to say," I asks, "that you went all the way up there and then didn't get a story?"

"Too right" (Australian for correct), ses Claude.

"What's the matter with you," I ses, "is that you ain't firm enough with 'em; give me that camera," I ses, "and I'll show you how to get it."

Claude handed over his equipment and I went up the stairs to the gate while Claude stood at the foot watching. I rang the bell and when St. Peter answered I said "Roos is my name. I've got a camera here and I'd like to make some pictures of your celebration this afternoon."

"Certainly," says St. Peter. "Come right in."

"Claude, from below, saw me enter the gate and came up the stairs three at a time and rang the bell.

"Well," says St. Petr, "what is it now?"

"Didn't you tell me a few minutes ago that you don't allow Cinematographers in Heaven?" asks Claude.

'That is correct," says St. Peter.

"Well," ses Claude, "you just let Len Roos in, and he's a Cinematographer!"

"Oh, no!" says St. Peter, "HE ONLY **THINKS HE** IS.

# *Amateur Cinematography*

*By* JOSEPH DUBRAY

*(Continued from Page 8)*

that a number of leaves, controlled by as many pivots, are simultaneously set in motion by the turning of a hub in such manner that an innumerable series of concentric round apertures are obtained.

The name **iris** is sometimes applied to these diaphragms, for the similarity of their play with the iris of the eye.

The volume of light admitted to form the image is of course dependent upon the area of the circular diaphragm and is therefore proportional to the square of their diameters.

The necessity of standardizing the nomenclature of the diaphragms of photographic objectives brought forth the following decisions agreed upon at the International photographic convention held in Paris in 1900:

"1—Each diaphragm shall be characterized by a fraction of the form F/n, where n is the number obtained by dividing the absolute focal length of the objective by the diameter of the diaphragm."

"2—For all objectives a uniform series of diaphragms shall be employed, such that the progression of the effective diameter of the diaphragms shall be as follows, which corresponds for each one of its terms to an exposure double of the preceding one.

| F : | F : | F : | F : | F : | F : | F : | F : | F : | F : | F : | F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.4 | 2 | 2.8 | 4 | 5.6 | 8 | 11.3 | 16 | 23 | 32 | 45 |

3—If the maximum effective aperture of the objective does not correspond to one of the terms of the preceding progression, the maximum diaphragm shall be characterized by a conventional sign, a point, the value of the effective diameter of such diaphragm shall be engraved with other inscriptions on the mount of the objective."

Thus the value of F/3.5 so common in motion picture objectives, is not to be found in the series above tabulated. The value F/3.5 will then be found on the mount of the objective following by the F/4 mark which is the next value to be found in the series. It is evident that the F/4 aperture will not require double the exposure of F/3.5, but only an exposure slightly under 1.5 times the F/3.5 exposure.

This series is now universally adopted with the exception that it has become customary to manufacturers to round off the F/11.3 mark to F/11.

It shall be noted that the exposures required with F. numbers are proportional not to the numbers themselves but to their "squares." This because the volume of light admitted to form the image is proportional to the "area" of the diaphragm and not to its diameter.

In any objective having a positive front element, the effective aperture is larger than the diameter of the diaphragm.

This is due to the condensing power of the front element, which tapers down, so to speak, the bundle of rays admitted to pass through the diaphragm.

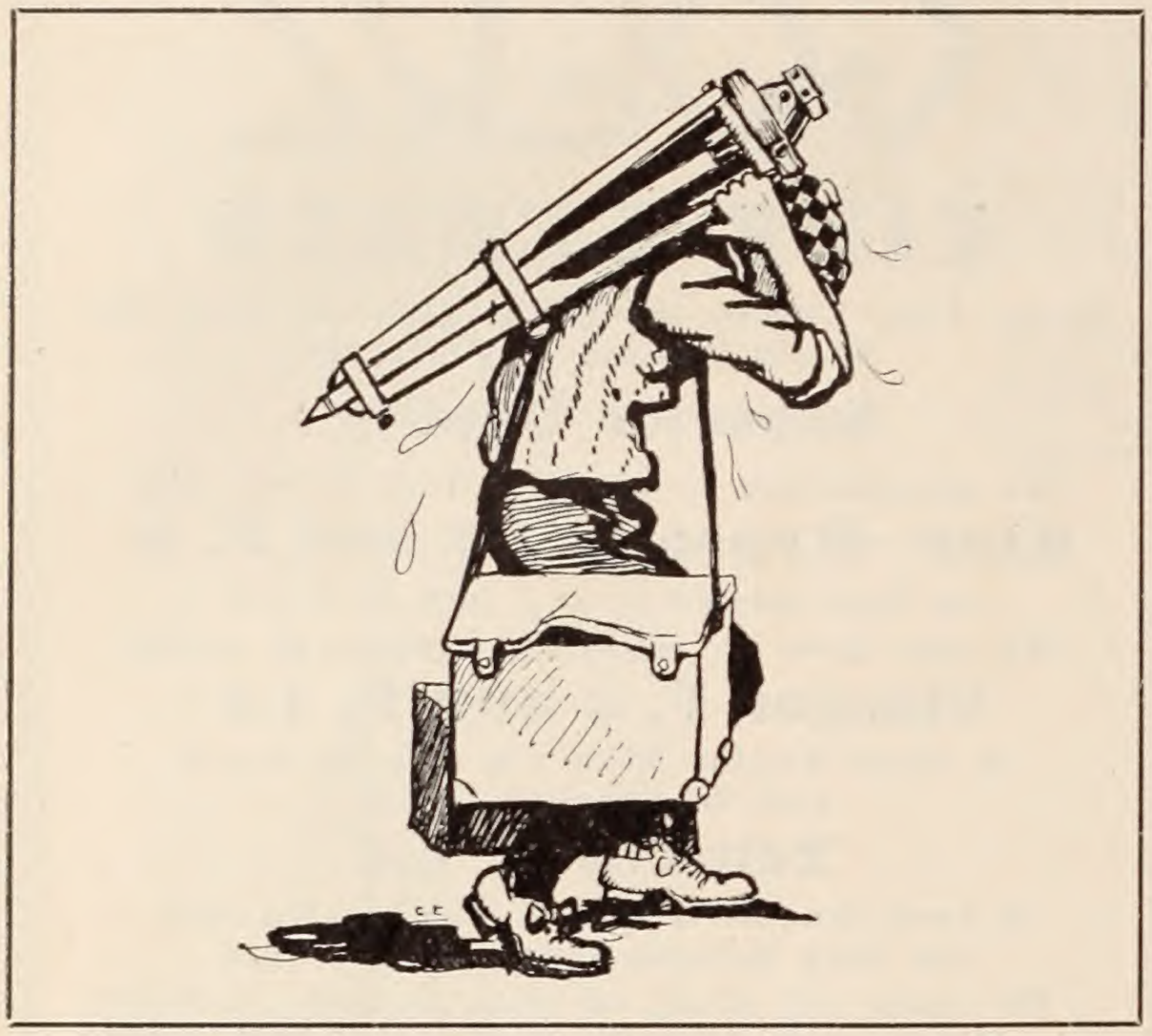
The truly effective aperture of an objective may be found thus:

Focus an object placed at infinity on the ground glass of a camera, replace the ground glass by a card with a pin-hole at the center of it, and then using this pin-hole as a source of light, receive the image of the dipahragm on a ground class or light sensitive material placed on the hood of the objective. The size of the image of the diaphragm so obtained will give the effective aperaure of the objective.

Many complaints have reached manufacturers of photographic objective who have been accused of misrepresentation in the aperture of their objectives because the actual diameter of the diaphragm instead of the real effective aperture of the objective has been measured.

The result of using the diameter of the diaphragm instead of the effective aperture may reduce the apparent aperture of an objective as much as one-third, for certain types of objectives.

# *Jimmy the Assistant*



A Purely Technical Discourse

*Copyright by Jimmy*

The more I find out about this game the less I know for sure. Just take exposure, f'rinstance. Way back in the Stone Age of pictures when I started we had film that was so slow that a right fast assistant could thread up a camera without foggin' no leader, unless the film got right out **in** the sunlight. We was grindin' this practically light-proof stock through old Pathe cameras with a 25% shutter opening and usin' nothin' but Heliar 4.5 lenses; and the only holler from the lab was about burnin' the stuff up. No kiddin', we'd go out and shoot a day's exteriors at around 8 and 11 and the negative would be denser than a business manager's report. And ther wouldn't be much reflection on the stuff, neither, because we didn't have no aluminum reflectors then—nothin' but the assistant doing the Goddess of Liberty act with a white sheet. And for night stuff we'd have only as many flares as we had guys to hold them, and that wasn't very many. Regular interiors were made on an open stage under diffusers with side light kicked in from white flats—the same as we box sets in with now. For spots we had mirrors, but we didn't ever use 'em unless we wanted to **see** somebody. The holler from the lab was always the same—burnt up.

Of course, the old lab system had something to do with it. We used a negative soup that was stronger than a lumberman's sock; and the idear in developing the stuff was to make it all come through on the celluloid side if it took a week. Your old time negative man wouldn't pull a rack until he could feel all the detail on the celluloid side with his gloves on and you couldn't see through the stuff no more'n you could see through a brick wall, and of course the emulsion side didn't mean **nothin'**—it was blacker than the prospect of a raise. I know of one lab that in two years' time didn't throw away more'n 63 cents worth of silver in the hypo. When those boys developed a negative it got **developed**—plenty!

Of course, the results wasn't what you might call ideal. What with the cameramen whittling their exposure down all the time, and the negative soup getting to be actually thick like mush there was times when some of the stuff commenced to look a little hard. When you get a negative that looks like the negative man had went off on a week-end vacation while it was cooking, and then come back and intensified it with silver, it stands to reason it ain't going to be easy to get a nice soft print off'n it. We just **had** to use step-printers in them days, so you could print a frame at a time and let it bake. And naturally, the positive didn't never get any too much light even through the parts of the negative you could **see** through, so when a roll was printed the positive developer would just put it to soak like a batch of clothes—come back after a while and see if there was anything on it. The only thing wrong with the system was that the negatives looked like positives and the positives looked like hell.

But it took nothin' short of the War to stop it. There ain't no tellin' how we would be workin' now if that war hadn't come along and saved the day. Prob'ly shootin' through pin-hole lenses on a dark stage with panchro safelights for illumination, and developin' nine hours in melted metol.

It was sure tough for a while after they clamped down on the regular developer. We had been using metol and ortol with hydroquinone; and all we could get now was hydroquinone. There's lots of angels that ain't got done weepin' yet at some of the stuff that come out of straight hydroquinone soup made after the knock-'em-dead formula. Hard? Boy, that stuff would just warp a screen right out of shape every time you projected it. You couldn't rewind it—you had to coil it, like a steel clock spring.

The situation got desprit. Exhibitors were hollerin' about the stuff bein' so violently contrasty—said it made permanent impressions on their screens, and the images left by last week's show was clutterin' up everything and they had to wait till it faded until they could open up again. About this time we figgered out that maybe we wasn't handling the stuff just right. Anyway, the cameramen got reckless and desprit and took a long stevie and opened up their shutters to 50%—sump'n they never did unless they was stuck to shoot daylight stuff at nine in the evening in November. And they started socking the exposure into the stuff—opened right up to 4.5, sometimes. Somebody tackled the same problem from the lab end, and started using a reasonable soup and not trying to bring up an image all over includin' fades.

Results resulted. Cameramen were giving the film more than a fleeting glimpse of the scene and used lights on interiors. It took a lot of hollering to get them lights, but they was finally got. The preducers died hard. They couldn't see why they should go to California for sunlight and then shoot in a barn with lights. Klieg lights! Nobody never uses them much now. Their very name only survives in the name for an inflammation of the eyes caused by the bad stuff they're selling nowadays.

The combination of both the cameramen and the lab men treating the business with the same care that they would if it was something delicate like a photographic process, for instance, brought the results that resulted, as I said. You could see who the people was, for one thing, and that was the foundation of the star system.

I don't have much trouble understanding them conditions because there was a real reason back of it all that you could figure out. The stuff was overdeveloped and improperly exposed, and that'll make anything—even a nice girl—hard. What does puzzle me is things the way they are now.

Where we used to get burnt up stuff with slow lenses and shock proof film the trouble seems to be all the other way now. Lenses have got faster and faster until now nobody tries to shoot unless he's got a hunk of glass on the camera that looks like a bay window, yet the negatives are running thin. We used to shoot with thin stops and get thick negatives. Now we shoot through a lens that looks like a port-hole glass off'n a battleship and the negatives is as weak as the star's excuse for bein' late. And not only that but the film has got faster and faster until now you can't speak above a whisper in the loadin' room without foggin' all the stock. That ain't all, neither. One punk little set gets more Killywatts turned on it in the way of lights than we'd use for a ballroom ten years ago, and yet it's all thin. Just a few months ago I heard a cameraman alibi an underexposed shot by sayin' that the set was so small he couldn't get enough lights into it. And he was right, too, for I seen the set. It was a little cabin, and his camera just could get a peek at the action through the forest

of sun-arc tripods that was crowded up to it. He was using exter fast film and a lens like a glass man-hole cover, yet the stuff was as gray as Monday morning.

It's all kinder hard to figger out but the ultimate result is clear enough. If they make the lenses any faster, and the film any more sensitive, and the lab machinery any more refined, why we'll just have to stop making pictures, that's all. It's hard enough to get an exposure as it is. All we need to sink us now is a stronger light.

It used to be that the only time we got a printably thin negative was when the lab man had a date and was in a hurry to get through. Now our only chance of getting a negative with pictures on it is to bribe some of the help to smuggle a few grains of developer into the developer. For the solutions is sure running weak. Some places they even dilute the wash water. I suppose it has to be. If they ever put a present day exposed negative into a tank of old time soup there'd prob'ly be a loud report and the lab man wonderin' where the film had went, or how the soup started boilin' so sudden. It all has to balance up somehow. In the old days when the cameraman used to keep the film in the dark as to what the scene was about, the lab had to blast an image out of it somehow, and did it with developers so strong that it would eat away three sets of racks a week; while now, when the cameramen sock the film with so much light that they have to turn at least sixteen to keep the film from ketching fire, the only answer is a solution so weak it has to be helped wet the film.

But there ain't no use me argin' the time honored cameraman vs. lab battle. You'd probly think I was exaggeratin', and besides, it's a argument like which comes first, the chicken or the egg. The answer is: both; and in the working of the cameraman and the lab there ain't no way that I can see how you can tell where one leaves off and the other begins.

It's all one job, you see; one single job the object of which is to put the best possible positive in the hands of the exhibitor. But as long as there's any jobs in the world that one man starts for another to finish there's goin' to be arguments, so I don't see no truce in sight ever. So I ain't even goin' to think about arguin' one side or the other, but there's this much about it: If they improve lights, lenses, or film one speck more I'm goin' to take back my paper route before the business crashes. One more improvement and pictures is sunk.

## *Our President Up a Tree*

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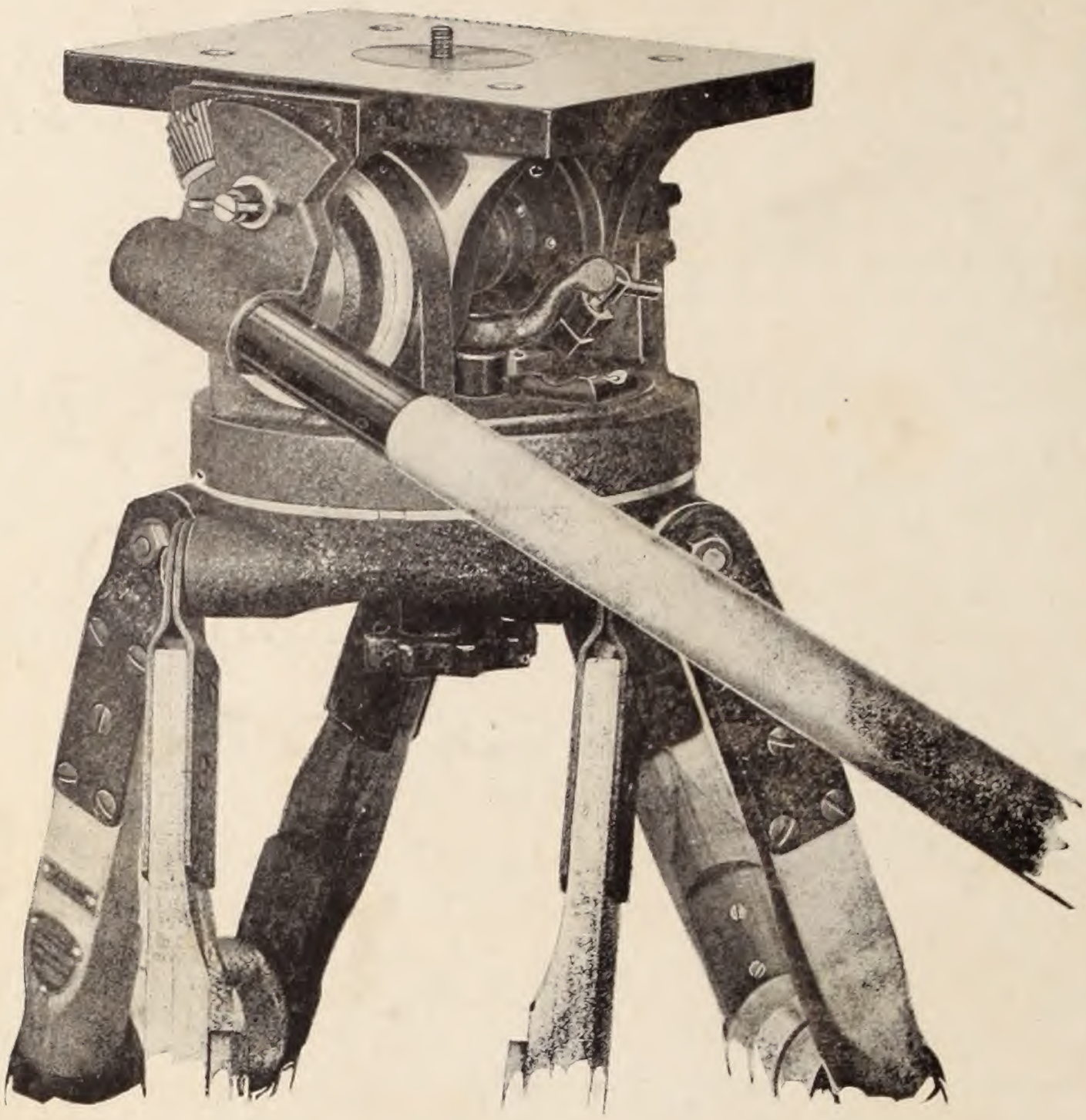

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